

ON QUANTITATIVE  
THINKING IN  
ECONOMICS

BY

GUSTAV CASSEL

OXFORD

AT THE CLARENDON PRESS

1935

OXFORD  
UNIVERSITY PRESS  
\*AMEN HOUSE, E C. 4  
London Edinburgh Glasgow  
New York Toronto Melbourne  
Capetown Bombay Calcutta  
Madras Shanghai  
HUMPHREY MILFORD  
PUBLISHER TO THE  
UNIVERSITY

PRINTED IN GREAT BRITAIN

## PREFACE

A THOROUGH reconstruction of economics as a quantitative science is urgently needed and, indeed, long overdue. In no other branch of modern science would such a general lack of quantitative definiteness as still prevails in economics be tolerated. The aim of the reconstruction must be to present the actual facts and problems of economic life in the most distinct form and, as far as possible, in measurable terms. To succeed in this work, economists must relieve themselves of the oppressive burden of withered notions and barren dogmas, inherited from the highly theoretical and scholastic controversies of a past century, and face with youthful vigour and up-to-date scientific equipment the problems of their own age.

Such reconstruction is of great interest to the steadily growing circle of those who, in their life's practical work, are confronted with economic questions and social relations of a more and more complex nature. What such people naturally demand, and are entitled to demand, is a clear exposition of the elements of economics, detached from old dogmatic controversies, free from contradictions and unnecessary complications, and so generally accepted that it can serve as a reliable basis for a profitable discussion of present-day problems.

The task is great; it involves in fact a general raising

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of the standard of *quantitative thinking in economics*. In the following pages I can only hope to indicate the principal lines of the work required and to illustrate its nature by discussing some few important points relating to the basic concepts and methods of economic science. This discussion, however, will touch and, as I hope, throw some fresh light upon several practical problems of social economy that stand at present in the centre of public interest.

Thus, this little book may perhaps contribute to a more general understanding of the fundamental and indissoluble connexion between theory and practice, and of the truth that there is, in the long run, nothing more practical than sound theory.

G. C.

DJURSHOLM, June 1935.



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# I

## ECONOMICS AS A QUANTITATIVE SCIENCE

**I**N its knowledge of actual facts as well as of historical development economic science has made wonderful progress during the last generation. Theoretical exposition, however, has hardly kept pace with this progress, and the foundations of economic theory have been especially neglected.

✓ Economics must essentially be a quantitative science dealing with quantities and their relations to one another and with conditions of equilibrium between forces that must be conceived quantitatively. A scientific study of economics, therefore, requires a certain acquaintance with the first principles of quantitative research. Most economists, however, have been brought up on other lines, and their equipment for quantitative thinking has often been defective. The result is that economic science has suffered at every stage of its growth from serious defects in quantitative thinking. The present state of the science offers clear evidence of this weakness.

✓ The mathematical form widely used nowadays in the discussion of economic problems is no guarantee of a deeper understanding of the quantitative nature of the problems. Authors may have acquired a certain amount of technical knowledge of mathematical

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formulae and methods of calculation and still have not acquired that strict training in quantitative thinking that would enable them to understand and critically judge how such mathematical methods must be handled and how much economic reality can be read into them. It has not even been generally realized that mathematics is an instrument for handling *measurable* quantities, and that the use of mathematics therefore always presupposes a measurability of the quantities considered. In fact, a mathematical treatment of economics has no value, and may easily be quite misleading, if it is not based on a thorough examination of the quantitative nature of the concepts introduced and on the adoption of definite measures for these quantities.

Let no one believe that such shortcomings are merely a concern of higher theoretical research and are of no importance to the general public, which only desires to understand the practical questions with which it is confronted daily in its social-economic relations. In fact, the confusion of economic science prevailing in our day is largely a confusion over first principles and fundamental notions, such as production, value, income, capital, saving, 'investment'. Nobody can avoid the bewildering consequences of such deficiencies. The public has a genuine and justifiable interest in the attempt to give a more satisfactory foundation to economic science.

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Economic theory stands out as having been singularly incapable of that form of renaissance which in other sciences manifests itself in an incessant clearance of what is no longer of value. Loose and dim concepts, falsely stated problems, confused reasonings, representations not in touch with reality—in short, all sorts of dogmatic rubbish inherited from earlier epochs and accumulated for more than a century—continue largely to determine the problems which economic science sets itself to study, and entangle fresh and constructive work in a mass of unnecessary difficulties. If examples are needed to justify this verdict it may suffice here to point to such flagrant cases as Ricardo's cost of production theory of value, Marx's 'surplus-value' (*Mehrwert*), Böhm-Bawerk's 'exchange-ratio between future and present goods' and the concept of a 'marginal productivity' in the social economy. Other cases of outstanding importance will form the subject of the following discussion.

A curious feature of economics is the special liking it has always shown for so-called 'laws', particularly when formulated in quantitative terms. Very little attention has been paid to the question whether a distinct meaning could be given to such 'laws' or whether they represented reality with any acceptable degree of approximation.

The result of all this worship of dogmatics is that immense obstacles are placed in the way of true

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scientific progress. This squandering of intellectual power, this appalling waste of time and labour of students and research workers, must cease. We cannot go on for ever, making our science pre-eminently a science concerned with the mistaken notions of earlier generations.

Economic theory surely cannot remain in its present backward position if it wants to be recognized as a discipline on an equal footing with other branches of modern science, in which clear quantitative thinking is a self-evident pre-requisite for the student, and in which such quasi-mathematical treatment as still largely prevails in economics would be regarded as amateurish.

I propose in this little volume to offer some critical and constructive remarks on quantitative thinking in economics. I do not pretend to present a systematic treatment of the subject. This would be possible only in a complete exposition of economic science. My *Theory of Social Economy*<sup>1</sup> is an endeavour—resolute in spite of all its unavoidable shortcomings—to build up economics as a quantitative science. In the following pages I hope to throw more light upon some of the main problems involved in this task. I shall have to give fresh emphasis to the quantitative nature both of concepts and of methods, and I shall have to insist, more urgently than ever, upon the necessity of purging

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economic science from a lot of vague notions, false reasonings, and untenable constructions, which—in spite of all earlier criticism—still dominate and daily remind us of the low standard of quantitative thinking prevalent in our science.

Criticism of this kind has often been recognized as justified. Nevertheless, economists have been reluctant to draw the ultimate conclusions and to reject uses of terms and presentations of problems and 'laws' which retain their position in economic science only by virtue of sterile tradition. This vacillating is intolerable. Either the criticism must be proved to be not justified, or—if that is not possible—a radical cleansing of economic science must be undertaken, and efforts must be concentrated on the task of giving a more satisfactory quantitative foundation to economic theory.

As an introduction to the following chapters I venture to offer here some preliminary observations on the elementary concepts of our science and on the very unsatisfactory way in which such concepts are usually formed.

Any one with scientific training who happens to look into what is called economic science must be struck by the great confusion in regard to fundamental concepts prevailing in that discipline. He will find terms used in an extremely loose way, and he will

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gradually perceive the appalling fact\* that there is in economics no such thing as a universally accepted terminology, not even in respect to first elements.

These defects are the result of arbitrariness in the introduction of definitions. Almost every author thinks himself entitled to build his theoretical constructions upon his own subjectively, and often rather casually, chosen concepts. Moreover, the quantitative fixation of the different concepts is for the most part lacking in precision. There is in economics much vague talk about 'quantities' without sufficient care being taken to ascertain that the concepts concerned can really be defined as quantities and are capable of being measured in definite units. These serious shortcomings do not prevent authors with some superficial knowledge of mathematics from representing such concepts by mathematical symbols and using those symbols in all sorts of formulae and calculations. Great authority is claimed for conclusions drawn from these operations, but it is not realized that the conclusions can have no definite meaning if the original concepts have none. Authors are therefore tempted to give to their mathematical results an interpretation which is not warranted by the facts from which their calculations started. For this reason a good deal of the conclusions of what is called mathematical economics would doubtless be found, upon closer examination, to be unreliable, not to say meaningless.



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The following chapters will offer some remarkable illustrations of the dangers of these pseudo-mathematical methods.

In order to establish economic science on a more satisfactory basis, economists must, to begin with, agree upon certain *Principles of Definition*. This is a question to which economic science has paid far too little attention, but which would deserve systematic treatment. Here I must confine myself to formulating a few rules which seem to warrant special attention.

The most fundamental principle is that the introduction of definitions should be based on a preliminary scientific analysis of economic reality. When this analysis has shown that a certain economic concept is of essential importance and can be distinguished with sufficient exactness, the time has come for giving a name to this concept, that is to say, for introducing a new definition (Rule I). Of course, care should be taken that the definitions correspond as nearly as possible to common language. But, as the popular use of terms is vague and variable, this desirable end can only be realized to a certain extent. On the other hand, it is a great mistake to try to arrive at scientific definitions in the reverse way, i.e. by starting from popular language and using merely linguistic interpretation of common words for fixing economic concepts.

As economic reality is a very complicated phenomenon, its analysis must always begin with ,

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simplification deliberately leaving out details and concentrating upon the first essentials. Such essentials of economic reality must form the elementary concepts of our science. Only when economists have arrived at a general agreement, at least on the most fundamental analysis of social economy, will a basis have been provided for an elementary terminology that can be universally accepted.

When we advance farther in our analysis and take into account more complex and dynamic features of economic life we shall find it necessary gradually to introduce new concepts, perhaps also to modify our elementary concepts and even—to a certain extent—to give them a new meaning. In doing so, however, we must always take care that the more advanced concepts do not come into conflict with the elementary concepts from which we started. It is always possible, or at least conceivable, that a more complicated or highly dynamic economy can gradually revert to simpler and more stable conditions. In that case we must insist upon our more advanced definitions becoming gradually transformed into the elementary ones—without any break in continuity (Rule II). If this rule is always observed the fundamental definitions in economics may be maintained intact in spite of a continual development of economic science and a progressive extension of its scope. Obviously this is an indispensable condition if we are ever to attain a

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standardization and a general recognition, which must be international, of our elementary terminology.

It is of great importance that our analysis should at no stage make assumptions unnecessarily restricting the validity of our conclusions (Rule III). Our most elementary conclusions must have an absolute validity for every conceivable economy. Proceeding farther, and approaching step by step actual economic conditions, we shall have to introduce assumptions unavoidably limiting the scope of the validity of our conclusions. But this limitation should never go farther than is required. At every stage of our investigation we ought to ascertain the actual limits within which our results may be said to have an unconditional validity. For instance, we should avoid the common mistake of introducing the assumption of private property in material means of production at a too early stage of our investigation of economic theory. Many, and very important, results of economic analysis in no way depend on this assumption, and therefore have validity even for an economy organized on socialistic lines. In my *Theory of Social Economy* I have shown that both interest on capital and rent of land must exist in a socialistic society and be determined essentially by the same causes as in our present economic order. Such truths escape our attention if we limit our examination of interest and rent to an economy based on the principle of private property.

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In choosing our definitions we must always let the *economic* point of view be decisive (Rule IV). This rule has not always been observed. Particularly, a *technical* way of looking upon production and distribution in their successive stages has been adopted with the result that the formation of economic concepts has been thwarted and the general plan of economic textbooks disturbed. A good illustration is afforded by the unduly restricted technical sense that economists have usually given to the term 'productive' and by the mass of false conclusions drawn from this mistake. The word has been interpreted in a linguistic way and has been understood to refer only to technical processes resulting in material goods. This interpretation has of course nothing to do with social economy, which is concerned with satisfaction of the wants of its members, whatever these wants may be and by whatever means they are satisfied.

Further, care must be taken that definitions introduced in a theory of social economy should really apply to *social* economy and not be merely generalizations of concepts referring to *private* economy (Rule V). On the whole, economic science has suffered much from the failure to realize that the domain it has to explore is social economy as a connected whole. What is true in private economy is often entirely false when applied to social economy, and the first thing the young student should learn when entering upon the study of

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social economy is that he has to leave aside all the vague notions he may previously have acquired with regard to private economy. The fundamental concepts of the theory of social economy must be based on an elementary analysis of that economy. For this purpose it is necessary from the beginning to study a *whole* economy, which is therefore also inevitably a *closed* or self-contained economy. The importance of this rule may be illustrated by the concept of 'production'. In private economy it means a technical process, beginning with the first efforts to acquire the raw materials, and leading up to the completion of a certain piece of product. As I have shown in my *Theory of Social Economy*, this technical view of the private business man must be replaced by the social concept of production as a continuous social process without beginning or end. In the following pages some further light will be thrown on the fundamental importance of this concept.

To these general principles of definition must be added the claim that, as far as quantitative concepts are concerned, their quantitative character should be made quite clear, their measurability be unambiguously established, at least as a theoretical possibility, and a definite unit of measure be fixed (Rule VI). It should no longer be tolerable to use terms that are meant to be quantitative in a vague manner, without these conditions being fulfilled. A broad survey

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of the development of natural science shows how decisively progress has been dependent upon the introduction of measures and methods of measurement. This is so not only in physical and chemical, and in technical sciences generally, but nowadays also in biology. Upon every extension of the domain of science the fixation of a unit of measurement proves to be essential. This cannot be otherwise in economics. The definition of a unit and the establishment of the measurability of a quantity in that unit should be regarded as indispensable conditions for introducing any quantitative concept into our science.

## II

### PRODUCTION

LET us now proceed to illustrate by a few important examples the deficiencies of current economic *concepts*, beginning in this chapter with those relating to production.

A case in which the lack of previous economic analysis is particularly prominent is that of the old Wage-Fund concept. Although the wage-fund theory is nowadays generally abandoned, it may be worthwhile to state what was the principal error of that doctrine. The starting-point for the theory was the idea that labour is supported by capital—capital being taken in the sense used by Adam Smith in his classical description of the position of the labourer: 'A stock of goods of different kinds must be stored up somewhere sufficient to maintain him, and to supply him with the materials and tools of his work . . .'<sup>1</sup> This idea is derived from views of the private business man and has no application to the whole economy of a community. The purpose of this economy is to satisfy the wants of its members and of the community as a whole. As these wants always exist, their satisfaction must be continuous. Thus production, as a social concept, must be a process continually going on and continually

<sup>1</sup> *Wealth of Nations*, Book II, Introduction.

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serving the needs of the community. This process supports *all* the members of the community, the capitalists as well as the labourers, and it does that continuously, day by day. This truth is *the first and most important result of a scientific analysis of social economy* and should be carefully observed when we proceed to form the fundamental concepts of our science.

In order to fulfil its function, the process of production must always contain a certain mass of real capital. The existence of this capital is a necessary condition for a continuous production and for a continuous satisfaction of wants. In addition, a steadily growing real income of the economy is only possible if the total stock of capital is steadily increased. Fixed and floating capital are equally necessary for the continuation of the process of production, and there is no reason for attributing to floating capital, or some part of it, any special importance for supporting the community. This gives the correct view of how all members of the economy, without any distinction, depend on capital for the continuous satisfaction of their wants. The wage-fund theory expresses an entirely false view of the mechanism of social economy, and the idea of a wage fund stands out as a typical example of a concept introduced into economics without a clear analysis of the social process to which it should apply. It is time to exclude this concept from the terminology of our science.



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A similar case is the concept of a Period of Production. It has become customary to speak of a 'period of production' that should represent the time generally elapsing between productive efforts and the satisfaction of wants made possible by them. For several reasons such a concept is impossible. Firstly, the satisfaction of a certain want usually requires a series of productive efforts spread over a long period. Secondly, a productive effort often serves the satisfaction of a series of wants, also spread over a long period. This is an essential feature of the economic mechanism, and therefore no definite meaning can be attached to the idea of a period of production. In addition it should be observed that the different efforts required for the satisfaction of a certain want are of a different nature and cannot be compared with or added to one another. Thus there is no ground for the calculation of an average of the periods elapsing between the different efforts and the result. The same holds good with regard to the different wants satisfied with the assistance of a certain productive effort. These circumstances form a further obstacle to the construction of a 'period of production' as a quantity capable of strict definition and arithmetical measurability.

✓ It might be thought possible to overcome these difficulties in a money economy where both efforts and wants are represented by their prices, and where, therefore, the necessary condition of comparability is

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fulfilled. We should then have to reckon with periods of investment of sums of money, and an average of these periods would be conceivable. Such a procedure, however, presupposes that all prices, both of efforts and of wants, are known. The different periods of production will then appear as variables, dependent upon these prices, and the concept of a 'period of production' would lose its character of a time-quantity simply determined by technical conditions. But then the usual reasonings based upon an average period of production and its lengthening or shortening would stand out as devoid of any conceivable meaning. In fact, the concept of an 'average period of production' has been built up on Ricardo's theory of cost of production, where 'labour' was considered to be the only factor of production that needed to be taken into account, and where 'labour' itself was thought to be reducible to a certain 'normal labour'. In such extremely simplified conditions the computation of an average of different periods of production seemed possible. As, however, this cost of production theory has been shown to be untenable,<sup>1</sup> any concept built upon it should logically be discarded.

<sup>1</sup> *Theory of Social Economy*, § 31. This concept of 'cost' is itself an outstanding example of a quasi-quantitative concept of which in economic reality no strict definition is possible. As we shall see in Chapter VII, the concept of 'comparative costs', which is the basis of the traditional theory of international trade, is equally defective and must be rejected.

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The different calculations of averages involved in the construction of an 'average period of production' are highly objectionable. On the whole, the term 'average' is very much misused in economic discussions. An average is a sum of quantities divided by their number, and can be calculated only when the items in question really are measurable quantities that may be added together. Further, the addition is permissible only when a definite weight can be given to each particular quantity, which naturally presupposes that the quantities are of the same nature, and that there are some grounds for attaching a certain importance to each of them. The average itself must also have a clear meaning, corresponding to the nature of the quantities added together in the calculation. To calculate an average of quantities of essentially different nature is nonsense and can never lead to a result to which we can attach any meaning.

In all these respects the calculation of an 'average period of production' characteristic of the whole social economy is a fallacy. We know that capital is needed for two different reasons: firstly because production, in a restricted technical sense of the word, takes time, and secondly because time is required for waiting for the subsequent services which a durable commodity can deliver during its lifetime. For example, it takes a certain time to build a house; and afterwards it takes a—usually much longer—a time to get all the use out of

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the house of which it is capable. Any endeavour to bring these two needs under one hat must lead to confusion. And to calculate an average of time periods, determined by such widely different conditions, is an illegitimate use of arithmetic.

Moreover, some capital is invested for ever, i.e. in constructions of such durability that no depreciation, and therefore no repayment of capital, needs to be reckoned with. A good example is a cutting through granite for the construction of a road. In such cases the period of production is infinite. But an infinite quantity can never be added to a finite one, and no average of such quantities is conceivable.

The economic reality with which we have to deal in studying the time element in production, and the role of capital in the whole economy, is more clearly perceived if we observe that, in the social process of production, a mass of durable goods are used which are themselves produced in the process. We call this mass the fixed real capital of the economy. This fixed real capital is continually maintained by repairs and by production of new fixed real capital in replacement of what is worn out. Thus, in the static economy the fixed real capital is kept constant. By 'floating real capital' we mean the mass of material goods on the way through the process of production or consumed in that process. This floating capital forms a stock that always exists and is not subject to the trans-

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formation which its individual parts are undergoing. In a static economy this stock always remains unaltered. The total real capital of the community is inseparably connected with the continuous process of production. It shares the changes in the volume of that process, and in a uniformly progressing economy it grows at a constant rate. But in a static economy the total stock of capital is always the same. The process of production has no beginning and no end, and the same holds true in respect of the stock of capital. In principle this capital is eternal. The essential characteristic of social economy is that it is perpetual, and that it always possesses, and must possess, a stock of real capital corresponding to the actual stage of development of the economy.

The idea of a 'period of production', like that of a 'wage fund', has its origin in the views of the private business man, but has no meaning in the social economy. The private investor may believe that he invests his capital for a certain period and that he can withdraw it after the lapse of that period. But this possibility does not exist for the social economy taken as a whole. The total capital of this economy is in principle invested for ever. A withdrawal of a part of this capital, enabling the community temporarily to increase its current consumption, is possible only within narrow limits and is a sign of exceptional disturbance. Normally, social capital is never withdrawn.

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rather, it is constantly increased. It is invested for ever, and if, in reference to this capital, we should talk about a 'period of investment', this period must be infinite. Had the character of the social economy as a continuous process been clearly realized from the beginning, there would never have been any talk of a 'period of production'. This vague and misleading idea is only another typical example of concepts based upon an inadequate analysis of the nature of the social economy. The conclusion is that the idea of a 'period of production', together with all the many imaginary constructions that have been built upon it, should be entirely eradicated from economic science.

Although this conclusion is obviously inevitable, the doctrine of a 'period of production' is still maintained in the text-books, and economists are constantly engaged in improving this concept and developing new and far-reaching theories on the basis of it. A striking example of how far even the most elementary principles of quantitative thinking are set aside in these endeavours is afforded by Professor Hayek's paper 'On the Relationship between Investment and Output' in the *Economic Journal*, June 1934, where he says that 'the only adequate representation of what is usually called the period of production or of investment' is a two-dimensional function. But a 'period of production' has necessarily the dimension of time and is thus one-dimensional. If authors do not

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agree even upon the dimension of the magnitudes they use' in economic discussions, or if, like Hayek, they speak of the lengthening or the shortening of a two-dimensional magnitude, nobody can wonder at the complete confusion prevailing in present-day economic theory.

The great interest taken in the calculation of an 'average period of production' can only be explained if we observe that such a concept was required to meet the needs of a very one-sided theory of capital which for a long time dominated economic science, and according to which the function of capital is only to enable us to let a certain time elapse between the productive effort and the harvesting of its fruits. The foremost representative of this theory was Jevons.<sup>1</sup> He and his followers believed that the stage of capitalistic development of the social economy could be indicated by their concept of an average period of production. If the supply of capital was abundant, the community could allow itself to use 'roundabout' but

<sup>1</sup> 'Capital, as I regard it, consists merely in the *aggregate of those commodities which are required for sustaining labourers of any kind or class engaged in work*. A stock of food is the main element of capital; but supplies of clothes, furniture, and all the other articles in common daily use are also necessary parts of capital. The *current means of sustenance constitute capital in its free or uninvested form*. The single and all-important function of capital is to enable the labourer to await the result of any long-lasting work, to put an interval between the beginning and the end of an enterprise.' W. S. Jevons, *The Theory of Political Economy*, p. 242, London, 1879.

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more productive methods, that is to say, to increase its income by means of 'lengthening the average period of production'. This lengthening itself came to be looked upon as a characteristic of all economic progress.

This exposition of the essence of social economy involves a fundamental error. If a lengthening of the period of production is to mean anything, it must denote a change in the technical methods of production. To make such changes possible is, however, by no means the exclusive role of capital. Even with strictly unaltered technical methods of production an increased supply of capital may be useful as allowing a more abundant supply of commodities, and particularly of those commodities which for their production require the use of a great amount of capital.

Before entering farther upon this subject, however, we ought to observe that a more natural and reliable measure of the importance of capital in the social economy could be obtained simply by calculating the quotient between the capital and the income of the economy. If we express both capital and income in terms of money, and if we assume a state of equilibrium in which all prices are fixed and where therefore real capital has a price corresponding to its cost of production, this quotient has a definite quantitative meaning, and is obviously an important characteristic of the social economy.



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It is interesting to note that efforts to find a satisfactory measure of the average period of production have led to the adoption of a definition of that period which, as Mr. Marshall says in the *Economic Journal* (March 1934), is 'identical with another interesting economic magnitude, viz. the ratio of the total value of existing commodities ("stocks") to the value of the current income or consumption ("flow")'. If this is so, we have all the more reason for abandoning the whole concept of an 'average period of production', and for concentrating our attention instead on the clear and measurable concept of the quotient between capital and income.

It is deplorable that statistical inquiry should have taken so little interest in the calculation of this quotient and of its variation from time to time. Of course, any endeavour in this direction would have been frustrated by the violent fluctuations of monetary units in recent times. If, however, we should live to see reasonable monetary stability established in our social economy, a statistical calculation of the quotient between capital and income would be possible, and would doubtless be a valuable contribution to our knowledge of the social economy and of the conditions of its progress. For pre-war conditions something between 5 and 7 seems to be an acceptable figure. Such a highly characteristic figure ought surely to be known with greater accuracy. Perhaps we shall be able some day

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by aid of more elaborate statistical methods, to disclose some general trend in the development of the quotient. The possibility that a long-period trend of growth may be established cannot be dismissed in advance. But, as far as we are now able to judge, such growth should not be very pronounced. It is even conceivable that the trend would be in the opposite direction. However that may be, the uncritical belief in a growth of capital relative to income, as a necessary characteristic of 'capitalistic' development, is simply a logical fallacy.

Thus, as a first approximation, we may assume that the quotient remains constant in a uniformly progressing economy. This means that capital and income grow at the same pace, which is the same as saying that the rate of saving remains constant. In such an economy an increase in social income is dependent upon a proportional increase in the capital of the society.<sup>1</sup> Such conditions correspond, so far as can be ascertained on the basis of available statistical data, approximately to the actual development in pre-war times, and, at any rate, a social economy progressing in that way is quite conceivable. Thus, in any case, a growth of the quotient of capital and income cannot be said to be an indispensable condition of progress. The question whether a 'lengthening of the average

<sup>1</sup> The factors determining the growth of social income will be further discussed in Chapter VI.

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period of production' is such a condition may be left to the supporters of that dim concept to decide.<sup>1</sup>

The doctrine that the sole use of capital is to make it possible to lengthen the average period of production, and in that way to increase productivity, was used as a basis for an ingenious but very artificial theory of interest, which still maintains a strong hold on economic thinking. The rate of interest was explained as being determined by the marginal productivity of the lengthening of the average period of production. We shall see later on (Chapter VI) that even this concept of a marginal productivity is inadmissible in a study of the social economy as a whole. But the theory of interest here referred to also suffers from the fundamental error of trying to represent as being determined solely by the Principle of Substitution the whole formation of prices in social economy. The phenomenon of interest was looked upon as depending on the possibility of substituting capital for other factors of production, and it was thought possible, in the last resort, to reduce any such substitution to a 'lengthen-

<sup>1</sup> In the March 1935 number of the *Economic Journal* Professor Knight has published an article in which he offers some sound criticism of the idea that the sole use of capital should be to allow a 'lengthening of the period of production'. He there seems to approach the views which I have advanced in my *Nature and Necessity of Interest* (1903), and which I have further developed in my *Theory of Social Economy*.

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ing of the average period of production'. Such a construction, however, gives an entirely false view of social economy. Economy is essentially an adaptation of needs to limited resources, and the fundamental principle of economy is therefore always the Principle of Scarcity. This holds good even with regard to the use of capital. We have to economize with capital because of its scarcity. Use of capital is required in different branches of production to a very varied extent, and therefore the satisfaction of different human wants involves the use of capital in very unequal proportions. If consumers' demand is partly shifted over to such wants as require much use of capital, e.g. electric light or house accommodation, this means that the total demand for use of capital in the community is increased. On account of the scarcity of capital this demand will have to be restricted by means of a higher price, that is to say, by a higher rate of interest. This rate is therefore fundamentally dependent upon the distribution of the consumers' demand between different wants. The demand for consumers' goods is ultimately a demand for different elementary factors of production, and among them for the use of capital. This demand can be kept within the necessary limits only by a rate of interest enforcing an equilibrium between the demand and a given scarcity of capital. This is the basic explanation of the phenomenon of interest, and it would be

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valid even if technical methods of production were fixed.

The possibility of substituting, in some cases, the use of capital for other factors of production implies a possibility of varying the technical methods by which given wants of the consumers are satisfied. Thus the same demand may be satisfied by means of a somewhat greater or smaller use of capital. This involves a certain modification of the principle of scarcity, which nevertheless retains its basic importance for the whole process of formation of prices and regulation of social distribution.

Thus it is obviously a mistake to try to push the principle of substitution into the foreground and to base the whole explanation of the phenomenon of interest on that principle. The futility of such endeavours becomes still more evident as the theory has to resort to such vague concepts as an 'average period of production' and a 'lengthening' of that period. If these concepts must be abandoned as having no place in a scientific inquiry, it follows that the theory of interest must be constructed on a basis independent of them. So far as I can see, this can only be done by introducing the quantitatively clear concept of 'capital disposal' and by studying interest as the price of this elementary factor of production.<sup>1</sup>

In some lines of production the need for capital

<sup>1</sup> Compare *Theory of Social Economy*, § 21.

## PRODUCTION

disposal may be great in relation to the product. In other lines of production it may be small. Such differences probably correspond most closely to the ideas of varying 'periods of production'. It must, however, be observed that the need for capital disposal can be compared with the product only if the product is represented by its price. But in this case it is by no means self-evident that economic progress involves an increase in the ratio between total capital and total value of the product, that is to say, total income. As we have seen, the satisfaction of some wants, such as housing, requires much fixed capital and thus also much capital disposal. Other wants, again, such as personal services, require very little or no capital disposal. It may be that in a progressive economy both these classes of wants grow in such proportions that the total need of capital disposal remains unaltered in proportion to total income. (See Chapter VI.)

### III

#### VALUE AND MONEY

VALUE is often taken to mean a quality of a thing in itself. Probably this is the prevailing popular view. Value in this sense, however, is not a scientific concept. The endless endeavours to elaborate it for use in economic science have revealed themselves as empty metaphysical speculations incapable of furthering in any way our actual knowledge of economic realities. In spite of that, economists have always been, and are still to-day, very much influenced by this view of value, and even the most searching and decisive criticism has not been able entirely to remove it from scientific discussions.

The socialist school has displayed a superstitious belief in value as a sort of fluid penetrating the commodities. The quantity of that fluid in each commodity was held to correspond to the amount of labour required to produce that commodity. In order to make this idea of value a quantitative concept, the 'amount of labour' was interpreted as the number of hours of 'normal labour' absorbed in the commodity. Marx, who had taken over that doctrine from earlier socialists, presented it with his overwhelming pseudo-philosophical terminology, and built upon it his famous doctrine of 'surplus-value', thereby gaining a half

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mystical influence over his innumerable followers, whose veneration for Marx may probably best be described in Ibsen's words: 'Surely an extremely gifted man; almost all he says passes one's understanding.'

Economic science must begin by recognizing that the value of a thing can only exist in relation to another thing: that it is an actual or conceivable exchange-proportion between two things. If we free ourselves completely from all metaphysical ideas and merely state in simple language what we are actually able to observe in people's valuation of things, we can only say that a man at a certain moment prefers A to B. All the complicated value relations discussed by what is considered a higher economic theory ultimately resolve themselves into this simple formula. The 'value-theorists' want to 'explain' this preference by stating that the man attributes a certain value to A and another value to B, and that the value of A is greater than the value of B. They believe that they make the motives of the preference more clear by thus referring it back to a comparison of absolute values. This, indeed, is a striking case of self-deception.

Value in an absolute sense does not exist. There is no possibility of defining such a value as a quantitative concept or of measuring different absolute values in a common unit. The advocates of the idea of an absolute value may take refuge in representing it as an



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intensity of feeling in the individual soul. But we have no measure of such an intensity. Still less does there exist any comparability between the feelings of different individuals or even of the same individual at different occasions. For these reasons the idea of an absolute value of a thing in itself has to be abandoned in economic science—definitely and for ever. In consequence, miles of economic literature could without harm—indeed with immense profit—be removed from the shelves of our libraries.

As the value of a commodity is an exchange relation to another commodity, we have to consider for each commodity quite a number of such exchange relations. Much simplification is attained if we make it a rule to express the value of all commodities in relation to a certain thing serving as a common denominator. 'Values' are then represented by arithmetical figures, which we call 'prices'. Thus we gain the great advantage that our valuations become measurable quantities.

In my *Theory of Social Economy* I have shown that the unit of price-reckoning, which has originally been a commodity, always gradually transforms itself into an abstract unit. Dried fish and the ox, which were used by ancient peoples for measuring values, were already such abstract units. This is, of course, still more the case with regard to our modern units, such as the pound sterling and the dollar. How the abstract

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unit of price-reckoning is determined is a question which has to be answered by the theory of money.

When the unit of money can be taken as practically fixed, the individual householder gradually acquires a wide experience of what he can get for his money. Thus he knows the conditions under which he has to make his choice; he is able to fix his several preferences, and consequently to arrange his household as he finds most suitable. If the prices of all commodities remain constant he accustoms himself to buying a number of different commodities in certain quantities and abstaining from buying other commodities. That is the most simple representation of his economic behaviour and the only form in which we can truly describe his valuation of different commodities and of money.

If the price of one commodity changes, say, if butter goes up a penny a pound, the householder has to consider how he shall meet this rise in price. He may reduce his consumption of butter correspondingly, or he may reduce his consumption of other commodities in order to meet his butter bill. He may perhaps also make extra endeavours to earn more money. In this choice he can usually assume other prices to be constant. This stability of the price system gives him the firm ground he needs for his actions. If great changes take place in the prices of all commodities, or if the purchasing power of money, as measured by the general level of commodity prices, is exposed to great

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fluctuations, he actually becomes unable to take proper care of his household. He loses all clear idea of the meaning of the unit of money, and a rational economy becomes impossible for him. This observation, which could constantly be made in periods of violent inflation or deflation, shows how dependent the individual actually is on a certain stability of commodity prices, and particularly on the stability of the monetary unit. Under modern conditions the individual *must* manage his household in a money form, and in doing so he must rely upon stability in the monetary unit.

If reckoning in a unit of money has this fundamental importance for every individual and for any social economy, it must be of the same fundamental importance for economic theory, that is to say, economic theory must start with the construction of a general theory of prices. If we observe the behaviour of the individual householder, as here described, we shall have all the material that it is possible to have, and that we need, for ascertaining his influence on the social economy. It is a fallacy to believe that we should be able to penetrate farther into this subject by introducing the notions of 'value' and 'utility', and by discussing marginal changes of these pseudo-quantities. This fallacy goes back to the superstitious belief in a 'value' or a 'utility' as a quality possessed by things in themselves.

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As in practical life it has been found convenient to abandon the reckoning in 'values', i.e. in numberless exchange relations, and to use a general reckoning in prices, so also should economic science abandon the entire so-called Theory of Value and, from the beginning, expound a Theory of Prices. This change of method of exposition, which I have advocated throughout my whole work in economic science, means a great simplification, which, in fact, has been very much appreciated by students. There has, however, been much opposition, based mainly on the argument that a wide domain of important economic reality, which could be treated by the old theory of value, would be left out of account if that theory had to be suppressed and replaced by a theory of prices. This is a mistake. All facts and relations that could conceivably be studied in the form of a theory of value can equally well—and indeed with immense scientific and pedagogical advantage—be studied in the form prescribed by elementary principles of quantitative thinking, that is to say, in the form of a theory of prices. When critics constantly repeat that, in reality, behind my formal theory of prices quite a series of value relations are considered, this is true, but it constitutes no objection. It has never been my aim to exclude any conceivable matter of economic knowledge from economic science. My programme is only to change the form of exposition. But this is an aim

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of fundamental importance if we want economics to be a quantitative science.

Once a reckoning in prices has been substituted for a reckoning in values, the very concept of 'value' would naturally have to be left out of economic discussion. Instead of that we find economists making the utmost efforts to preserve the notion of 'value'. In doing so they even go so far as to introduce such concepts as 'value of money' and 'utility of income' and to discuss marginal changes of such 'quantities', believing that it is possible in this way to describe any reality in the economic attitude of the individual. Such empty constructions are actually used as a basis for judging questions of the greatest practical significance, such as, e.g., the graduation of progressive taxation; the 'marginal utility of a sum of money' being presented as a serviceable measure of the sacrifice connected with the paying of taxes. Even when elaborated with the highest mathematical finesse such concepts and reasonings seem to me to be little more than arithmetical toys, for which there should be no place in the study of a serious student.

If we leave aside the question of the fixation of the price unit, and devote our attention to the general theory of prices, we find that this theory shows how prices are determined relatively to one another, or, what amounts to the same thing, how prices are

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determined except for a multiplicative factor. The fixation of this factor is a monetary concern that must be distinguished from the general theory of prices and treated in a separate theory of money.

The aim of monetary policy must always be to fix the monetary unit, which in itself is only an abstract unit of reckoning and therefore quite undetermined. This fixation, however, may be attained in different ways. For fixing the absolute height of prices it obviously suffices to fix the price of *one* article, for instance, the price of one ounce of gold. We then have a Gold Standard. We might also fix the average price of important articles suitably weighted. We would then have a Fixed-price-level Standard. It should be observed that this use of the term 'Standard' is the only rational one. The talk about a 'Gold Exchange Standard' or 'Gold Bullion Standard', &c., is slang, intolerable in a quantitative science.

If commodity prices are determined except for a multiplicative factor, it is irrelevant which price we choose to fix. The effect is always the same: prices that were formerly only determined relatively to one another now become fixed absolutely. In the ardent struggle about the best monetary standard this elementary truth seems mostly to have been overlooked. The choice of the price to be fixed becomes important only when *relative* prices begin to vary. A substantial alteration in the value of the standard commodity in

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relation to other commodities may have a great, and naturally harmful, influence on the stability of the general price-level or on the purchasing power of the monetary unit. If, however, we fix the price of a whole basket of a great number of representative commodities, we may expect variations in the value of this basket, relatively to commodities in general, to be reduced to a minimum, and we shall have secured a large measure of stability for our monetary unit. This is undeniably a strong argument in favour of the fixed-price-level standard.

The choice of the price to be fixed may acquire a material importance especially through its influence on the value of the standard commodity in relation to other commodities. If the fixing of the price of one commodity leads to an accumulation of large reserves of that commodity and thus increases the demand for it, this commodity will rise in value in comparison with other commodities. As the price of the standard commodity is formally fixed, the result will be a fall of the general level of commodity prices, which may have a very disturbing effect on the whole social economy. Such a fall can only be prevented if circumstances permit an abundant production of the standard commodity, or if a policy can be agreed upon with a view to restricting the demand for that commodity. The history of the gold standard and its final collapse may serve as a sufficient illustration of the dangers of the tendency to

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accumulate stocks of the standard commodity. When a great number of important commodities is selected for the fixing of an absolute price, an accumulation of huge stocks of these commodities is hardly possible, and the disturbing influence of such accumulation is reduced to a minimum. This is obviously a second point in favour of the fixed-price-level standard.

In a gold standard, as experience shows, it is possible within wide limits to allow variations of the general level of commodity prices and yet to maintain the price of gold at its parity. This possibility depends on the elasticity in the use of gold reserves as a basis for bank means of payment. Consequently the central bank, in spite of being bound to maintain the gold standard, has a certain freedom of action in shaping its monetary policy, and may therefore pursue a second aim. This aim may be the smoothing out of such fluctuations of the general level of commodity prices as usually occur in connexion with trade cycles, independent of changes in the relation between gold supply and demand. The leading central banks may also co-operate by a suitable gold-reserve policy to give the highest possible long-term stability to the value of gold in terms of commodities. It must, however, be fully understood that there are definite limits to such freedom of action. The popular belief that *any* aim can be set up for monetary policy—side by side with the fundamental fixation of a single price, such as that



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of gold, or of a certain price-level—is a dangerous confusion of thought.

The Bank for International Settlements emphasize, in their Fifth Annual Report (dated 13 May 1935, p. 45), that the restoration of the gold standard is the first aim of the collaboration between central banks. 'The second object of collaboration', the Report continues, 'is to attempt, as far as is possible by monetary and credit measures, to smooth out the business cycle, and to contribute towards a greater equilibrium in the general level of economic activity.' This statement may be accepted if we interpret it as the Report does when it proceeds: 'Put otherwise, the second objective implies a recognition that, within the limits of their specific powers, it is an appropriate goal of central bank policy to attempt to reduce undue fluctuations in the purchasing power of gold and thus to contribute towards bringing about a greater measure of stability in the value of money.' A warning, however, should be given against those vague ideas which public discussion usually connects with a statement of the aim of monetary policy in the first formulation of the Report.

How the monetary unit is fixed is, as here explained, *statically* irrelevant, that is to say, an economic system would work just as well and in the same manner with one monetary unit as with another—provided stability of relative prices could be presumed. Nevertheless, an *alteration* of the monetary unit must have the most far-

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reaching consequences for the whole social economy. These consequences will by no means be restricted to the monetary field. The whole system of relative prices will be affected, and thus it will not be possible any longer to maintain the distinction between monetary and purely economic problems, which is certainly natural and very valuable in the first and elementary exposition of economic theory. If, for instance, we have fixed our monetary unit by fixing a *certain* price-level, and if we do not succeed—as we probably never shall—in maintaining an absolute stability of that price-level, variations above and below the fixed price-level will not only be of monetary importance but will also affect relative prices, and thus cause disturbances in the whole economic system. The same must then be true of measures taken to correct such variations and to bring the price-level back to its standard height. Such measures must inevitably affect every part of the social economy. Thus the idea of a ‘neutral money’, that is to say, a monetary system under no circumstances influencing relative prices, is a phantom. Under dynamic conditions there can be no ‘neutral money’. Any monetary policy must, then, influence the whole economic system. The practical problem can only be to reduce these disturbances to a minimum. In this respect a fixed-price-level standard has here been shown to possess two distinct advantages over any single commodity standard.

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These results illustrate the fundamental importance of drawing a clear line of distinction between static and dynamic conditions. If we want to teach economics as a quantitative science, close attention must always be paid to this distinction. The emphasis that I have laid upon it in the discussion of the Quantity Theory of Money (*Theory of Social Economy*, § 51) has proved to be only too well justified.

Rival monetary systems are ultimately based upon different methods of fixing the monetary unit. Various and contradictory methods have been proposed, and new ones are continually forthcoming. It has even been advocated that it would be better not to *fix* the general price-level, but to make it *vary* according to some given formula; for instance, the general price-level could be lowered in accordance with falling 'costs of production'. This would, of course, also be a method of fixing the monetary unit. The keen discussion as to the advantages of these methods which continues to absorb such a disproportionate part of the public interest has not very much to do with science. In fact, it is impossible to prove by scientific deduction that any method of fixing the monetary unit is the 'right' one. The choice of this method is entirely a question of practical policy. And here simplicity is of paramount importance. The gold standard used a very simple rule: it only fixed the price of gold. Under the rule of the gold standard people were satis-

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fied with that method of fixing the price unit, and no objections were made to it so long as the supply of gold was sufficient to maintain a fair stability of the general price-level. In 1931 the gold standard broke down on account of a scarcity in the supply of gold, coincident with an immense and entirely irregular increase in the monetary demand for gold. In such a situation it was doubtless the most natural aim for monetary policy to try to maintain, by direct means, that stability of the general price-level that had been reached approximately in times of a more normal development of supply and demand in the gold market. This aim was practically realized by the establishment and the gradual growth and consolidation of the 'sterling bloc'. But, instead of accepting such a simple and natural solution, theorists eagerly set about constructing new schemes which were alleged to correspond better to some preconceived ideas of monetary stability. They even went so far as to declare that a stabilization of the general level of commodity prices would seriously jeopardize the stable development of economic life. To an unbiased observer of this highly theoretical struggle, it must seem somewhat inexplicable why the maintenance of a fixed price for *one* commodity—gold—could have been accepted as a good solution as long as the gold market developed normally, whereas a fixation of the price of a collection of the most important commodities should have to be

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rejected as an unscientific and dangerous experiment.

The practical problem that we have to solve in our choice of method for fixing the monetary unit is first of all to find a simple rule that can be universally understood and internationally accepted. •The fixation of the general level of wholesale prices, as commonly calculated in our official index numbers, seems then to be the best solution. Such a price policy would allow labour to obtain its share of increasing productivity in the form of a continual rise in nominal wages. This is doubtless a social advantage, as such a system would promote peaceful relations between labour and capital.

At any rate, the fixation of the price unit by choosing the stabilization of the general level of wholesale prices as the aim of monetary policy, would give us a monetary system infinitely better than anything that the world has ever possessed before. In fact, the stability of the whole economic system would be the same as could be obtained under the rule of the gold standard when that system worked under ideal conditions. Is there any reason, at least for the present, to ask for more?

When a rule for fixing the monetary unit has been chosen, and people know that it will be strictly maintained, economic life will adjust itself to the monetary conditions thus established. No rule can be perfect: no rule is more than a practical convention. But, if a

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reliable monetary stability is guaranteed, production and trade will accept it as a workable basis, and a sound economic development is possible. The proof of this is given by the pre-war gold standard, which—though certainly imperfect from the point of view of strict stability—yet served as a basis for splendid economic progress.

In very disturbed conditions, it is naturally difficult to say at what height the monetary unit ought to be stabilized. There will always be divergent views as to what is 'justice' in this matter. There will always be interests feeling that they have been put at a disadvantage, and even capable of giving good reasons for this view. Any fixation of the unit will require a great deal of adjustment of factors and relations that have become unbalanced during the time of monetary instability. Once the entire economic system has been thrown into disorder, no standard exists for a stability in the monetary system that would represent economic equilibrium. In such a situation what we must do *first of all* is to adopt a suitable standard and on that basis stabilize the monetary system. *Afterwards* the entire economic structure must be compelled to adjust itself to that monetary system. Not until this has been done, can it be expected that the basis selected for the stability of the monetary system will represent economic equilibrium.

This holds good in regard to both the internal

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economy of a country and its relations with foreign countries. In order to make the matter perfectly clear, let us begin by imagining a self-contained country without any connexion with the outside world. If the economic equilibrium of such a country is completely shattered, that country must commence by fixing a definite standard for the regulation of the value of its currency. The standard selected may be, for example, the stabilization of a certain level of wholesale prices, either that which already exists, or some other price-level—let us say, one that is raised in a certain ratio to the existing level. Once this standard has been adopted, economic forces must be given sufficient play to adjust the entire economy of the country to the fixed value of the currency. It is therefore meaningless to find fault with the standard selected because it does not from the outset represent economic equilibrium. Such a standard can never be found and it is sheer waste of time to look for it.

This applies also to the world economy. When the world's economic organization has fallen into such utter disorder as at present, it is not possible to establish an international monetary system with stable rates of exchange if we insist upon the demand that this system shall represent from the outset an international economic equilibrium. We must begin by drawing up a monetary programme. To this programme a number of countries should adhere by maintaining stable rates

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of exchange as between one another. The present sterling group is a good example. It is based on the monetary programme submitted by the British Government to the London Conference (1933), and afterwards followed up by the British Empire Declaration (27 July). A country that wishes to join the sterling group has only to adopt a fixed rate of exchange on London and then to maintain it. In such a case, reasons will always be advanced for different rates of exchange, and it is vain to try to find the 'right' rate. Any rate will cause certain disturbances and disadvantages, and there is no rate that could be said to be 'the true equilibrium rate of exchange'. This must be so, as under disturbed conditions no true equilibrium exists. It remains to create an equilibrium, and this can only be attained by fixing a definite rate of exchange. In order to reduce subsequent disturbances to a minimum, care should be taken that this rate corresponds as nearly as can be ascertained to the purchasing-power parity of the currencies concerned. Once the rate of exchange has been fixed, all interests have to adjust themselves to it. Such an adjustment will naturally in some cases be somewhat painful, but if sufficient freedom is given to economic forces it will generally be accomplished within a short time, and afterwards all parts will share the prosperity resulting from the reconstruction of the nation's economic life upon a reliable basis. Moreover, the fixed rate of exchange



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will then gradually prove to be a true equilibrium rate of exchange.<sup>1</sup>

In a state of disequilibrium the principal practical need is always to bring about monetary stability in some form or other, and to do so with the least possible delay. At the beginning of the twenties this question was in the forefront of monetary discussion, and I then advocated the view that a speedy return to the gold standard at any reasonable parities was the paramount interest.<sup>2</sup> Under the present extremely disturbed conditions the establishment of monetary stability is again the paramount interest, only the technical method must be different, the gold standard—in consequence of grave mismanagement—having collapsed beyond repair.<sup>3</sup>

Let us now leave these practical considerations and return to the theoretical problem with which we are concerned in this chapter. When monetary stability has been established—on the basis of some accepted standard—all values will be expressed as prices reckoned in the unit of money which is regarded as

<sup>1</sup> On this question see further: 'The Restoration of the Gold Standard', *Skand. Kredit AB's Quarterly Report*, July 1934.

<sup>2</sup> *The World's Monetary Problems*, Two Memoranda, London, 1921; *Money and Foreign Exchange after 1914*, London, 1922; see particularly the last chapter on 'the problem of stabilization'; and *Das Stabilisierungsproblem*, Leipzig, 1925.

<sup>3</sup> On this point I may refer to my article, 'The Sterling Bloc', in the supplement to the *Daily Telegraph*, London, 1935.

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fixed. We shall then be in a position to construct a concept of the highest theoretical and practical importance, namely, the concept of a 'sum of money'. A sum of money strictly identical with itself during a certain time is conceivable only if all prices remain constant during that time. When this condition is fulfilled the owner of the sum of money will have, at the end of the period, exactly the same choice of goods to be acquired with the said sum, and in this sense the sum may be said strictly to have maintained its identity with itself.

For practical purposes, however, we must be content with less stringent claims on identity. Individual prices may be allowed to vary, but the unit of money should remain unaltered, i.e. retain an unvariable purchasing power. In our choice of a standard of monetary stability we should not forget that it must be possible on the basis of this standard to construct the indispensable concept of a 'sum of money identical with itself during a certain time'. If this standard is the stability of some general price index, the 'sum of money' will have a constant general purchasing power as against commodities included in that index, and will in this relative sense be identical with itself. If, however, no monetary stability is maintained, it is impossible to speak of a 'sum of money' as existing throughout a period. Economic life is then exposed to serious practical difficulties which are most patent when loan contracts are concerned. Both lender and

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borrower start from the assumption that the object of the loan is a certain sum of money, and that the same sum of money should be repaid at the end of the loan period. In fact, all contracts expressed in terms of money and running for a period of time tacitly assume as self-evident that the unit of money is preserved at identity with itself. This assumption can, however, as we now see, only be fulfilled if the unit of money is fixed in such a way as to guarantee a recognized stability in its general purchasing power.

For economic theory generally, the concept of a sum of money identical with itself during a certain time is indispensable. To a large extent such an identity has quite uncritically been taken for granted—a fact that throws much light on the standard of quantitative thinking prevalent in economics. On the other hand, the lack of a clear and definite concept of a 'sum of money' has caused economists many difficulties and, if nothing else, quite unnecessary complication of the exposition of their science. For the theory of interest, in particular, this concept is of fundamental importance. It allows us to construct the concept of 'capital disposal' and to treat interest as the price of that service (*Theory of Social Economy*, § 21). The advantage of this treatment is that the rate of interest is given the same position as all other prices in the general theory of price formation—which is, of course, an indispensable condition for the possibility of a theory intended

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to explain the process of price formation in its entirety. We see, however, that a strict definition of the rate of interest is possible only when all prices remain unaltered. This condition may be regarded as being fulfilled if the theory aims—as an elementary theory must do—at ascertaining the conditions of economic equilibrium, that is to say, the conditions under which all prices remain constant. When variations in relative prices are admitted, an approximate meaning may be given to 'the rate of interest', if stability of the unit of money is maintained according to some accepted standard. It should be observed that, only when such an equilibrium rate of interest has been defined, is it possible to speak of actual bank rates as being 'too high' or 'too low', or to discuss the effects of such deviations from the equilibrium rate.

We see, then, what far-reaching importance a fixation of the monetary unit has, both for the theory of interest and for the entire theory of money.

Once we have recognized under what conditions we are able to speak about a sum of money as existing identical with itself during a certain time, we immediately realize that the same conditions must be fulfilled if we are to speak of 'income' in terms of money. The concept of money income necessarily refers to a period of time, and therefore presupposes the concept of a sum of money identical with itself during the income period. For this reason the many endeav-

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yours recently made to elaborate concepts of money incomes under dynamic conditions, with variations in the purchasing power of money, can hardly lead to a result of which the concrete meaning is immediately intelligible. If a sum of money, identical with itself during a certain period, cannot be presupposed, there is no basis for the concept of a money income during that period.<sup>1</sup>

When the monetary unit varies from year to year, the incomes of these years may be compared with one another if incomes of succeeding periods are expressed in the monetary unit of the first period. For this purpose, we may use a general index of wholesale commodity prices equal to 100 for the base year, and divide the income for each subsequent year by this index. Thus the 'growth of income' during a series of years may be defined in spite of changes in the monetary unit. It should, however, be observed that this definition depends on the choice of our index number and to this extent includes an arbitrary element. If, however, we have taken the fixation of the general level of wholesale commodity prices as our standard of monetary stability, it is natural to use the same standard for measuring the growth of social income in terms of money.

An estimate of the growth of income is also obtain-

<sup>1</sup> For a discussion of such concepts of income see Lindahl's paper in *Economic Essays in Honour of Gustav Cassel* (London, 1933).

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able by studying the rate of growth of physical production of different standard commodities. The commodities that we may choose for such a comparison will probably be much the same as those which may be used as a basis for our index of prices. Thus we should arrive, broadly speaking, at about the same rate of growth whether we measure in money or in physical units.

This is not so if we use a cost-of-living index number for the reduction of the money incomes to a common unit. Let us assume, for the sake of simplicity, that the monetary system has been stable in the sense that the general level of wholesale commodity prices has remained constant during a certain period. Let us also assume that this period has been characterized by rapid progress. Then, as said above, wages will generally have risen. In consequence, personal services will also have risen in price, and for this reason the cost of living must have increased. This unavoidable increase is often accentuated by the fact that labour in sheltered industries succeeds in raising its wages out of proportion to other wages. Thus, dividing the annual income figures by a cost-of-living index, we shall find a rate of progress usually much lower than that shown by the growth of money incomes, even if the latter are expressed in a monetary unit which is stable according to the wholesale-price index standard.

In some cases this difference is very considerable,

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and it is therefore always necessary to state how we have measured the rate of growth of the 'social income'. When, on various occasions, I have given some general estimates of this rate, these estimates should always be taken to refer to a monetary stability as defined by the stability of an index of wholesale commodity prices. I have come to the conclusion that the average normal rate of progress in the domain of western civilization in pre-war times must have been something like 3 per cent. per annum. This figure applies to income as well as to capital. My estimate has received very valuable confirmation from Mr. Carl Snyder of the Federal Reserve Bank of New York in his comprehensive statistical investigations, which are extended over the half-century preceding the War, and also include more recent experience in regard to economic progress. Other statistical material recently published seems to indicate that the rate of progress mentioned also represents the underlying trend of post-war development. For the present we may use the figure of 3 per cent. as a standard with which actual progress in different countries and in different periods may be compared.

Economists have been particularly reluctant to give up the idea of an absolute value when they have been concerned with what is called the 'value of money'. Of course, even in this case, the belief in an absolute value is in contradiction to elementary logic. The

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value of a monetary unit can be conceived only in relation to commodities. It simply denotes how much of this or that commodity can be had for the monetary unit. More generally, we may form an approximate conception of the value of a monetary unit by stating how much that unit can buy of a certain collection of commodities, in which each commodity is represented in some proportion to its general importance in the social economy. In this sense, the value of the monetary unit is identical with its purchasing power as against commodities in general, or, in other words, is equal to the inverse value of the general price-level.

However, there are still economists who adhere to the notion that it is possible to distinguish between a 'value of money' and a 'value of commodities',—both 'values' being taken in some mystical absolute sense—and to attribute variations of the general level of commodity prices partly to changes in the 'value of commodities' and partly to changes in the 'value of money'. To enter upon such distinctions is definitely to leave the domain of science, and lose oneself in metaphysical speculation. The mischievous influence that this complete neglect of the most elementary principles of quantitative thinking has had, and continues to have, on economic discussion is deplorable. In fact, the aversion often displayed to any rational programme of monetary stabilization has its principal basis in a superstitious belief in an 'absolute value of money'



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The aim of monetary policy has been proclaimed to be a stabilization of that value, as distinct from the 'value of commodities', which was conceived as an independent variable exerting its own influence on the general level of prices. Such objections to monetary stabilization have been brought forward most pretentiously; and have very much hampered a sound development of the theory of money. Even prominent authors have been unable to perceive the basic fault in these objections, and have therefore been content with endeavours to minimize their practical importance.

Economic science ought definitely to refuse to have anything to do with metaphysical speculations of the character here indicated. But instead of that we find representatives of the absolute-value mysticism praised as leading thinkers with special powers of analysis and ranked with investigators who really have done something in the exploration of economic reality. Nothing shows more clearly how important, and indeed at the present moment how urgent, it is to maintain the claim that economic science should be based on clear quantitative thinking, and that no pseudo-quantitative concepts should be allowed to falsify and obscure economic discussion.

However, even if we leave aside all notions about absolute value, there still remains the question, whether it is possible in the analysis of alterations of the general price-level to distinguish between causes

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on the commodity side and causes on the money side. The distinction commonly made here seems to be based on a mere confusion of thought. If the monetary unit is left undetermined, the general price-level must be equally undetermined, that is to say, it can be anything between zero and infinity. Under such conditions it is obviously meaningless to speak of the general price-level as a quantity or to discuss the causes of its alterations; and to isolate influences exerted by factors 'on the commodity side' is inconceivable.

If, on the other hand, the price unit is determined by some definite rule, factors on the commodity side can influence the general price-level only in so far as that rule permits. In a paper standard the most natural rule for determining the monetary unit is, as has been said above, to fix the general level of commodity prices. If this rule is observed, there can be no fluctuations of that level. If, however, the rule is so formulated that certain changes of the general price-level shall take place, the actual occurrence of such changes must be ascribed to a monetary administration that aims at giving effect to the rule. If the monetary system is based on gold there may, of course, be variations in the purchasing power of the unit of money, and the question may be put, How far are such variations due to causes on the gold side or to causes on the commodity side? We shall discuss the

possibility of answering this question in Chapter V. If, however, stability of the general price-level is recognized as the supreme rule for monetary policy, all variations of that level under the gold-standard system must be ascribed to shortcomings in that system or in its administration, and are therefore of a monetary nature.

The factor on the commodity side most commonly supposed to exercise an independent influence on the general price-level is the reduction of the costs of production resulting from technical progress, or from what is nowadays generally spoken of as 'rationalization'. There is no reason why such a reduction of costs should lower the general price-level. What is reduced is the margin between prices of finished goods and prices of elementary factors of production. If this reduction is used in suitable proportions to lower prices of finished goods and to raise prices of elementary factors of production, among them principally wages, the general price-level may well be kept constant. As a matter of fact, the general price-level was practically the same in 1910 as it was in 1850, in spite of the immense economic progress during that period, and in spite of the great reduction in costs of production connected therewith. The explanation is that the supply of gold was, for the period as a whole, sufficient to keep pace with the economic development. With a scantier supply of gold the price-level of 1910 would

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have been lower than that of 1850. But this fall in prices would have had nothing to do with the reduction in costs of production. The whole explanation would have had to be found in the fact that the gold supply was insufficient to meet the needs of a progressive world. The necessity for this explanation is perhaps most clearly seen if we regard the reverse case, in which the gold supply is supposed to have been more ample than it actually was. A rise of the price-level would then have taken place in spite of the reduction in costs of production, and this rise must have been ascribed solely to the superabundance of the supply of gold. Under a paper-standard system in which the aim of monetary policy was recognized to be the maintenance of a constant price-level, reductions in cost of production could obviously have no influence on the price-level. Any fall of the price-level would then have to be regarded as a result of inadequate monetary administration.

The idea that a reduction in costs of production ought to be followed by a fall of the general level of prices has been particularly resorted to when people had to explain the great crisis of 1929. It has been contended that this crisis was the inevitable result of a previous boom of extraordinary dimensions. In order to prove the existence of such a boom, people have invented the myth that there was an extreme increase of production in the twenties, particularly in the

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United States. Such views have been advocated even in so authoritative a publication as the *World Economic Survey*, issued by the League of Nations (Geneva, 1932). This work is a telling example of how far the exposition of facts may be distorted by a preconceived but false theory. The actual figures now known completely disprove the suppositions in question. We shall revert to a study of the American development in Chapter VI.<sup>1</sup>

Of course it could not be denied that the price-level had been remarkably constant during the 'boom' years 1923-9. But it was contended that the price-level ought to have *fallen* on account of the great reduction in the costs of production. Indeed, the absence of such a fall was represented as an inflation. We have now seen how completely groundless such an explanation is. It should only be added that even the supposition of an exceptional fall in costs of production during the period in question is exaggerated. Rationalization is no new invention of the twenties. It has been going on for a century. If it was carried out at a special speed in the twenties, the principal reason no doubt was that the legal eight-hour-day and insistence of powerful labour organizations upon unaltered weekly wages

<sup>1</sup> See further my discussion of the question in *Skand. Kredit AB.'s Quarterly*, October 1932, 'A Contribution to Characterization of the Crisis'. Compare also: 'Circular letter from the National Industrial Conference Board', dated New York, 6 March 1935.

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compelled enterprises to resort to the greatest possible reductions in the use of labour. But costs were by no means reduced thereby in the same proportion.

This example shows with particular emphasis the great practical importance of a sound theory of economic causation. In Chapter V we shall have an opportunity of making some further observations on the general principles of causal analysis.

## IV

### INCOME AND ITS USE<sup>1</sup>

THERE is a widespread notion that the community suffers from a shortage of purchasing power. This idea has its chief support in certain popular views of saving, which is supposed to have the effect of drawing purchasing power away from the market. We frequently hear complaints that people who can afford to buy 'withhold' their money instead of 'putting it into circulation'. The basis of this aversion to saving is evidently the idea that saving renders a part of the social income inoperative as purchasing power. This, however, is an error, due to lack of insight into the nature of saving.

There is also a common idea that the entire income of a community increases at a slower pace than its production, and that therefore this income does not suffice to purchase the entire production. This is likewise an error. The fallacy lies in a lack of insight into the nature of income.

These popular fallacies are by no means innocuous. They affect people's attitude towards important questions of economic policy, and form the basis for much

<sup>1</sup> In this chapter use has been made of two articles published in the *Quarterly* of the Skandinaviska Kredit AB. in April and July 1935.

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false criticism of our entire social structure. At present we are witnessing the mischievous results in a swelling volume of misdirected State intervention in the economic sphere, and in repeated and dangerous proposals for creating 'purchasing power'.

Evidently the only effective means of suppressing these fallacies is to present in the clearest possible manner an elementary theory of the formation and spending of income. Latterly, however, any such attempt has been rendered far more difficult by the support which the popular fallacies have received, or are supposed to have received, in recent theoretical investigations of the disturbances in the monetary system. In so far, however, as these investigations have any scientific value they are essentially not concerned with purchasing power in the sense now intended, but with the community's supply of means of payment.

A tendency to convert assets into means of payment creates an extra demand for means of payment. If the available means of payment are in part left unused, that is to say, are not utilized as such, or are utilized in an abnormally low degree, this will entail an increase in the total need of means of payment in relation to payments actually made. Again, means of payment may be used for the repayment of bank debts. Such a procedure diminishes the supply of means of payment. In these various ways the scarcity of means of payment

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may be aggravated. It follows from what has been said, that such an extraordinary scarcity may exist even when bank statistics show the circulation of bank-notes or the amount of demand deposits to be unusually great. If, however, the banks do not increase the supply of means of payment sufficiently to restore normal relations on the money market, difficulties may be placed in the way of continuous sale of the commodities produced. The consequences manifest themselves in falling prices, curtailed production, and increasing stocks; in short, in all the characteristic symptoms of a slump. On the surface this state of things appears to be the result of a 'shortage of purchasing power', which the general public attribute to a defect in the *economic* structure of our social order, as distinguished from its *monetary* system. In reality we have to do here with a deflation, i.e. with a process of a purely monetary nature. Modern theories of crises have devoted particular attention to the phenomena just mentioned, but have not sufficiently stressed their *monetary* character: in fact, they have often connected them with *economic* processes in such a way as actually to confirm the general public in their erroneous views.

The behaviour of the public here alluded to, the result of which is a shortage of means of payment, is of course due to a lack of confidence, arising from certain disturbances, either of an economic or of a political

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character. The motives will not be discussed here. What is essential from our present point of view is to establish the fact that the process itself is entirely a monetary phenomenon. It has no intrinsic connexion either with the formation and the use of income or with any particular kind of income or capital. When in public discussion the subject is constantly associated with saving, placing profits to reserves, writing-off on account of depreciation, or other disposal of income or capital, this is extremely misleading. Anything that can be sold can, of course, be exchanged for means of payment. Any possession of capital or income can therefore be utilized for demanding means of payment. It is consequently quite arbitrary to associate such demands with particular parts of income, whether it is a matter of saving by individuals, writing-off, or other reservations, by companies, or similar measures.

The attitude of the public to the supply of means of payment must be dealt with as a separate question of a purely monetary character. Such a distinction will be found to be of advantage both for the theoretical exposition of the subject and for practical politics. The separation of questions relating to the supply of means of payment to a chapter by itself makes it possible to build up the general economic theory on the assumption of a normal supply of means of payment. It will then become clear that nothing in the *economic* structure of our present society necessarily leads to a

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lack of purchasing power in relation to total production. In dealing with depressions as a matter of practical politics, we shall gain the advantage that disturbances of a monetary character will be met with monetary measures. It should be particularly observed that any shortage of means of payment, at any rate in theory, can be remedied by the banks by creating additional means of payment, i.e. by a certain monetary policy. To that end the banks need merely increase their lending or purchase more securities. For example, if people convert their savings into bank-notes and put them in their stockings—as they do in France—the natural remedy is to issue a corresponding amount of new bank-notes. One practical consideration is that such measures will certainly be much more effective if they are taken at once, as soon as occasion arises, and before the disturbances have reached such dimensions that they can be controlled only with the greatest difficulty. If the banks succeed in carrying out such a policy, any remaining disturbances—which will then doubtless have been considerably mitigated—are of a purely economic character, and should be dealt with as such.

The principal elements in the theory of the formation of income and the use of income—on the assumption of a normal supply of means of payment—are as follows:

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Income is the remuneration which any one receives in return for his co-operation in the general process of production. This definition covers also the profits of the entrepreneur, any loss being reckoned as negative income.

The total income of the community is equal to the sum-total of the remuneration received by all those participating in the process of production, and is thus equal to the total value of what is produced.

Hence it follows that the total income suffices to purchase the total product. The popular belief in the insufficiency of the total income is thus a fallacy.

This summary statement, however, needs to be made more precise in respect to the time element. If we fix our attention upon a definite income period, we have to observe that this period may consume products which it has taken over from earlier periods, but is on the other hand bound to replace these products by its own production. These two items cancel one another, and the total product which the period puts at disposal of its income earners, and which we may denote as the *net* product of the period, is therefore equal to the total value of the production actually carried out during the period, which is the same as the total remuneration of the factors of production, and thus as the total income, of the period. Thus our first summary statement maintains its validity.

Certain charlatan teachings that have recently taken

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a conspicuous place in popular discussion of social economy as well as in political agitation—both in England and on the Continent, but particularly in the United States—lay much stress on a supposed insufficiency of income for buying the whole product of the community. This incongruity is represented as an intrinsic fault in the capitalistic economy and is often taken as a sufficient ground for rejecting our entire social order. The main argument of this criticism seems to be that sums written off as capital depreciation enter into the cost of production of all commodities and thus form a part of the total value of the product, whereas such sums do not form an income in the sense of remuneration for participating in the productive process during the income period. From this the conclusion is drawn that total income is insufficient for buying total product. This conclusion is wrong. It is simply overlooked that the cost of production of new capital goods for replacement represents an income for those engaged in this reproduction. This income—which is at disposal for buying the net product—is equal to the total value of the replacement goods, and thus also to the total sum written off for depreciation and debited to the cost of the net product. Thus total income suffices for buying total net product. The sum written off for depreciation is available for buying the replacement goods. This pricing process therefore does not in itself give rise to any

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disequilibrium between purchasing power and price of product.

It may be objected that there is no certainty that the money paid back to the capitalists as depreciation will actually be used for buying replacement goods. In some way, however, this money must be used. If it is used to a certain extent for an increased consumption by the capitalists, production of consumers' goods will grow, whereas production of replacement goods will decrease correspondingly, and the balance between total production and purchasing power will even then be maintained. The case is, however, an entirely abnormal one, as it involves a diminution of the total stock of capital of the community.

The only remaining possibility, that depreciation money is used for acquisition of means of payment, constitutes, as we shall see presently, no real exception to the rule that the social income suffices to buy the social production.

Thus this rule must be recognized as a general economic necessity. On this point economic science should make no concession whatever to charlatan teachings, which are certain to use such concessions only for giving more force to their unsound agitation.<sup>1</sup>

Neither income nor capital can exist merely as abstract figures, but must always have some concrete

<sup>1</sup> Compare Hawtrey, *Economic Journal*, December 1934, p. 646, note 1.



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substratum. There is a prevalent notion that the receiver of income usually waits some time before he decides to spend it in a certain way, and that in the meantime the income is unused, in the sense that it exists merely as a figure. This view is untenable. The income is from the very outset invested in real assets or claims. A factory worker acquires his income at the very moment when he performs his work. For the time being the income has the character of a claim on the company, which has a corresponding asset, say, in the goods which it produces. The worker's income is then invested in those goods. When the income is paid in notes, the worker obtains instead a claim on the note-issuing bank, which must have a corresponding asset, say, in bills of exchange representing goods on the way through the process of production. The income will then be invested in such goods and will remain so as long as the worker keeps the notes.

The income, again, may be invested from the outset in fixed assets. A builder's labourer acquires income by carrying on the building work. When the wage is paid, this is done in the form of bank money, for which the bank has cover, say, in a claim on the building in the shape of a bank loan.

Thus there is no 'unused' income even for a single moment. No time elapses between the acquisition of the income and its investment. If the receiver of the

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income subsequently decides on a special investment, this merely involves a change of investment.

The income may be used in two different ways. It may be spent, which means that it buys utilities of consumption, whether goods such as food, or services such as the use of an apartment or personal attendance. The income, again, may be saved, which means that it buys real capital. As we have seen, it is used in this way from the very outset.

Thus, in all circumstances, the entire income is used to buy the results of the process of production. There is no lapse of time before this occurs. We also know that the income in its entirety suffices to purchase the entire production.

Saving therefore in no wise involves any withholding of purchasing power from the market. Saving constitutes effective purchasing power quite as much as consumption. The total saving of the community buys the increment of its stock of real capital during the income period.

At this point an important observation should be made. Income from the beginning takes the form of capital and remains capital as long as it is not consumed. So far there is no sharp line of demarcation between income and capital. Only the term 'income' refers to a flow of goods during a certain time, whereas the term 'capital' represents goods existing at a certain moment. This is an essential distinction between the

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two concepts. Full lucidity on this point is of particular importance with regard to the concept of 'capital disposal' as an elementary factor of production.<sup>1</sup> It has sometimes been objected to this concept that what savers put at the disposal of the community is not capital but income. Our analysis of income and its use shows that this distinction is meaningless and that the objection has no validity.

Under normal conditions production is adjusted according to the proportion in which the receivers of income use it for consumption or for saving. The productive forces are divided between the production of utilities of consumption and the production of real capital precisely in the proportion determined by the demand. There is thus, normally, a perfect correspondence between supply and demand as regards both utilities of consumption and real capital.

This equilibrium may, of course, be disturbed if the public change the apportionment of their income as between consumption and saving. For example, should the tendency to save increase, production will have to be readjusted so that the productive forces will be employed to a somewhat greater extent on the production of real capital. Such a readjustment will naturally entail some friction. But this will merely be of the same nature as the friction entailed in those unceasing changes in the demand for various articles

<sup>1</sup> *Theory of Social Economy*, § 21.

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of consumption to which production always has to accommodate itself. As a general rule, adjustment to a varying rate of saving will not involve any great difficulties, provided it is only allowed to run its natural course and is not impeded by arbitrary intervention. \*Nor does experience show that any considerable or sudden changes in the desire to save are caused by *economic* motives. Should such marked changes occur, they will be found to be due, as we shall presently see, to *monetary* disturbances.

The adjustment of the process of production to a more abundant supply of savings is promoted by the lowering of the level of interest which is the natural consequence of the changed situation on the capital market. It is, of course, assumed here that such changes are permitted to find their immediate expression in a reduced rate of interest. This, however, is not always the case in practice. On the contrary, it seems to be a common occurrence that the banks do not follow fluctuations on the capital market with sufficient promptitude in the adjustment of their rates of interest. Should the banks, in the supposed case, maintain their rates of interest at the previous level, these rates would exceed what would correspond to the equilibrium rate of interest. The result would be a repayment of bank loans and thus a shortage in the supply of means of payment. This shortage leads to a general fall in prices; in other words, a process of deflation sets in.

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A lowering of the general level of prices is equivalent to a rise in the purchasing power of money. Holders of means of payment take advantage of this rise. People will therefore use as much as possible of their assets for the acquisition of means of payment, and perhaps will even deliberately increase their savings to that end. The latter situation occurs if people postpone their consumption in anticipation of a further fall in prices. The increasing demand for means of payment depresses the price-level still more. This cumulative character of the process of deflation makes it doubly dangerous. It is therefore of extreme importance that the bank rates should be promptly adjusted to changes on the capital market. If this is done, the cause of the fall in prices is eliminated, the supply of means of payment again becomes normal, and the economic process can continue its regular course.

The situation just described, in which the general public show a tendency to an abnormal demand for means of payment, and thus use their income for hoarding, has particularly conduced to bolster up the notion that income can be left unused, and that consequently the effective purchasing power would fail to correspond to the volume of production. If one wishes properly to understand what really happens on such an occasion, it should first be realized that such income as is used for the acquisition of means of payment is

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*even then invested in real assets or claims.* Even in these abnormal circumstances there is no income which is 'unused' in the sense that it exists merely as a figure. From the point of view of the banks, means of payment are liabilities, and the banks must at any given moment possess corresponding assets, in which the money of depositors or of holders of bank-notes is ultimately invested. These assets usually consist in the loans and investments of the banks, i.e. in claims on goods moving through the process of production, or claims on governments or other bond debtors. Central banks keep huge gold reserves against their liabilities. All these assets are commonly looked upon as genuine investments. It is difficult, then, to understand why income that has been converted into means of payment should be regarded as 'uninvested'.

On the other hand, *means of payment as such* may be unused, or poorly utilized, in the sense that they are not used to the normal extent for making payments. It is this state of things that causes a fall in prices. The effect, as previously indicated, will be the same if means of payment are annihilated by being used for repayment of debts to the banks, and if in this way the total supply of means of payment is reduced. When prices have fallen, however, the supply of means of payment becomes sufficient, even with their low degree of utilization, for effecting the payments required, and there will no longer be any lack of

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purchasing power. Thus, as soon as the process of deflation has been stopped, income proves to be sufficient for buying the whole product of the income period.

It follows that what is called shortage of purchasing power is invariably a *monetary* phenomenon, connected with a process of deflation. There is nothing in the purely *economic* mechanism of our society that can give rise to a lack of purchasing power. The realization of this fact is of immense practical value. The consequence will of course be that the evil which is popularly designated as 'shortage of purchasing power' will have to be counteracted by monetary measures. A shortage in the supply of means of payment can be overcome only by positive action on the part of the banks with a view to increasing that supply. On the other hand, to attempt to combat a 'shortage of purchasing power' with measures of a purely economic character must be an error. The remedies that are so much recommended nowadays of diminishing saving, or of cutting down the profits of companies, or curtailing the reserving of profits, must be rejected as falling wide of the mark, just because they are directed to economic phenomena, whereas what is really wanted is a remedy for the deflation, which is a monetary disease. During the course of a deflation it is not saving as such that is noxious, but the abnormal acquisition of means of payment, whether in the way

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of savings or by the realization of assets. To carry on a crusade against saving is a mistake and very objectionable from the point of view of national education.

It seems to be a widespread belief that sums written off for capital depreciation have a particular tendency to be left unused. This belief even gives rise to a certain aversion to this use of gross income. As we now see, the idea is based on the assumption that such sums should preferably be converted into means of payment, and that these means should be unused or annihilated by being paid back to the banks. Actual facts give no support to this view. Writing-off for depreciation is naturally most extensive in boom periods when companies make large profits and can afford to write off considerable sums. In such periods the supply of means of payment is usually abundant and their 'velocity of circulation' is high. For instance, during the boom period in the United States before 1929, when good profits were made, deposits as a whole were not reduced by repayment of debts to the banks. On the contrary, they grew so fast and were so intensively used as to frighten people not conversant with the conditions of economic progress and to cause fantastic complaints of a 'credit inflation'.

Our analysis definitely disposes of the popular belief in the existence of money as mere figures. The superstitious idea that during a depression masses of money are accumulated without any concrete assets



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behind them is often met with even in works pretending to be scientific. We are taught to look upon such money as a reserve which is put into use when the depression ends, and thus makes a new boom possible. Such empty mysticism is daily repeated with the most sublime thoughtlessness by the thousands of parrots of the financial press, and so the public gets accustomed to speaking of 'money' and of its abundance or shortage without ever realizing what they really understand by these phrases. It seems to be an important task for quantitative economic science severely to censure such hyperbolical, and at bottom meaningless, representations, and to insist upon a definite concrete meaning being given to everything that is said about money as well as about income and capital.

There is room for the same remark in regard to another but similar superstition widely entertained by the financial and political press, viz. the idea that stock exchange speculation draws 'money' or 'capital' from productive employment. Such an idea is possible only when people overlook the fact that such concepts as 'money' and 'capital' must represent realities, and in addition forget the simple truth that anything that is bought must also be sold. In this question the need for clearer quantitative thinking is perhaps more conspicuous than anywhere else.<sup>1</sup>

<sup>1</sup> See further my articles on the subject in the *Quarterly of the Skandinaviska Kredit AB.*, October 1928 and April 1929.

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The Midland Bank regularly publishes percentage figures showing the proportion of current accounts to total deposits, the intention being that these figures should serve as a useful index of trade activity. When these statistics were introduced the bank pointed out that 'demand deposits are essentially money in active use in business of all kinds, while time deposits have more of the character of money awaiting investment and money for which no trading use can be found at the moment'.<sup>1</sup> This distinction between 'money actively at work' and 'money awaiting investment' may easily be misleading. If money is taken to mean means of payment, time deposits are not money at all, whereas demand deposits are. The term 'money', however, is probably used here as representing funds entrusted to the bank by the depositors. These funds are all invested in the assets which the bank keeps against its deposit debts. If there is any distinction, it must be that time deposits are invested for a somewhat longer time, whereas demand deposits are invested in assets of a particularly high liquidity. If funds are transferred from time deposits to demand deposits, the total volume of investment is unaffected, but the supply of means of payment is increased. The volume of demand deposits taken together with the rate of turnover determines the volume of payments

<sup>1</sup> *Midland Bank Monthly Review*, London, January-February 1929.

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effected. This figure is a suitable index of the activity of trade.

For our present discussion it is of special importance to emphasize that all deposits are always used in the sense that they are invested; as money, time deposits are not used at all, whereas demand deposits, taken as a whole, are always used—more or less intensively. To speak of 'idle money' is loose language which cannot but confuse the public. Income and capital are always invested, and no funds are 'idle' in the sense that they remain for any length of time uninvested. Part of demand deposits may for some time be unused as means of payment and in this sense be 'idle money', but the idleness refers then exclusively to the monetary function.

These remarks should be sufficient definitely to overcome the terrible muddle into which the question of use or non-use of income and capital has been thrown.

Recent monetary theory has given a prominent place to a distinction between 'saving' and 'investment' and to a conception of investment as a mere part of total saving. It even seems to be quite a common view that this distinction marks an essential progress of the whole theory of social economy. This may on good grounds be questioned.

First of all such a distinction is apt to make the

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public believe that some savings would be left uninvested and be doomed to the mysterious existence of a disembodied spirit. It is the first duty of scientific theory to fight against such loose and dim notions.

Serious objections also arise to ranking 'investment' as an independent economic concept. Investment is in its nature not a quantity, which it obviously must be if it is to be put on a level with saving and even be capable of being subtracted from it. As we have seen, income that has not been consumed, nor been used for repayment of debts to the banks, is always invested in the sense that it has a concrete existence in real capital or in claims or other rights. If the new theory desires to limit the concept of investment by connecting it with some particular act on the part of the saver, that is to say, if 'investment' is interpreted to mean a choice of particular securities, it must firstly be observed that the great majority of savers never make such a choice themselves but leave that to the banks or to savings institutions of various kinds. The funds entrusted to such institutions certainly cannot be regarded as 'uninvested'. But even if the saver himself decides upon a particular investment, this does not necessarily mean that his act has any corresponding reality in social economy. If a saver buys bonds it may be another saver who sells them, and it is by no means certain that the purchase leads to an increase in the total quantity of circulating bonds. Even if this should

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be so, the companies that have issued the new bonds may use the money for repayment of debts, for instance to the banks. Thus, if we want to give any social-economic reality to the concept of investment as a quantity we are forced to identify it with an increase in the community's stock of real capital. This concept, however, already inevitably enters into even the most elementary economic theory. There is no need to introduce a new name for this basic concept.

Those who would interpret investment as an act on the part of the saver conducing to a more *active* co-operation of his savings in the process of production must realize that this greater activity is a very relative concept. If, for example, savings are invested in stocks of materials, these stocks may flow through the process of production with greater or less speed, and thus the investment of the saver may be more or less active from the point of view of the social economy. The same applies to savings invested in fixed real capital, for instance in machinery. Machines may be used more or less fully and intensively. In all such cases, however, there is a question of a difference in *degree*, and this difference cannot possibly justify a distinction between 'invested' and 'non-invested' funds as being two different categories.

Nor is it the *saver* who determines the degree of activity which his saving shall receive. This is the function of the entrepreneur, and should the saver

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actually exert such an influence by a definite choice of investment, he turns himself *eo ipso* into an entrepreneur.

A period of depression is characterized by reduced activity in the process of production. The fixed real capital is only partially used, and floating real capital runs through the process of production more slowly than normally. At the same time, a certain degree of unemployment prevails. Thus the capacity of production surpasses the actual production. The problem is then to give increased activity to the whole process of production, so that all factors of production may be used as completely as possible. It is of great practical importance to realize that this is the aim of all endeavours to overcome the depression. For economic theory it is equally important to realize that the remedy is to give greater activity to investments, not to invest funds that have been left 'uninvested'.

When a part of the savings is used for repayment of debts to the banks with a corresponding reduction in the supply of bank means of payment, it may be said that total savings are greater than total investments. But this phrase only means that the banks fail to compensate the annihilation of means of payment by a corresponding issue of new means of payment. Normally, such a compensation constantly takes place, and a deviation from this practice must therefore be regarded as a cause of the resultant depression. We

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have to do here with an occurrence of a monetary nature, in fact with a process of deflation which should be treated as such.

If people believe that the depression essentially results from a surplus of saving above investment, they will readily conclude that the depression ought to be combated by a reduction of saving, that is to say, by more liberal spending. Lately this has also been recommended, in a somewhat sensational way, as a cure for the depression. Once it has been made clear that a depression can only be conquered by increasing the activity of economic life, this question will stand out in a new light. Of course it may be said even then that increased consumption would itself result in higher activity. It is, however, by no means sure that a reduction of saving would be the right remedy. During the depression it is no doubt usual for production generally to slow down. Its two main branches, the production of consumers' goods and the production of capital goods, are, however, as a rule, affected by this reduction in a very different degree. The characteristic feature of the depression is precisely that capital production shows a much more marked decrease than the production of consumers' goods. Our endeavours must therefore be directed principally towards increasing the production of capital goods. This is only possible, however, if savings are forthcoming in sufficient volume.

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A continued saving must gradually relieve the capital market and bring down the rates of interest. If such a development is allowed to proceed in a natural way, it gives to capital production a stimulus that usually proves sufficient for such an increase in this production as will put an end to the whole depression. This is, as we know, the way in which a turn of the business cycle is normally brought about.

The opinion that further saving would be unnecessary during the depression is supported by the belief that the community has been supplied with too much real capital during the previous boom. The under-estimation of the importance of saving in a period of depression is supported by the fact that everybody can see how inadequately the real capital is used. However, the ideas about a superfluity of real capital are mostly rather exaggerated. Statistical figures showing the low degree of utilization of real capital must be read with great caution. The real capacity of production is usually far from being so great as the figures indicate. In fact, a considerable part of the real capital is adulterated and does not come up to the latest standards of efficiency. For this reason, incessant work for the renewal of the real capital is going on even during the depression, with the result that its efficiency is being continuously increased. The American steel industry, in spite of a very low degree of employment, continues to invest tremendous sums



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in modernizing its equipment. In spite of an enormous volume of tonnage being laid up throughout the world, the building of new ships with higher efficiency is continuously going on. Such an improvement in the community's stock of real capital has always been an essential factor in superseding the depression.

This is doubtless also the case in the present depression. If we should once succeed in eliminating the disturbances which are its cause we should certainly find that our equipment of means of production is in many respects entirely unsatisfactory.

Moreover, the house accommodation of the community is always insufficient. For the satisfaction of this want, as well as for a better utilization of the means of production in general and thus for the purpose of ending the depression, it is of essential importance that building activities should increase. To this end, however, an incessant supply of new savings is required. Indeed, in the present situation the most hopeful sign of recovery is the stimulus given to building by the low rates of interest.

Thus we find that a continuous saving is an indispensable condition for economic recovery. It must be wrong therefore to try to conquer the depression by any endeavours to check saving or to disparage its social-economic value.

So long as private enterprise is insufficient for the necessary increase in economic activity, a reduction of

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unemployment by the aid of public works seems to be a natural way out. This enables a more complete use of the productive powers available, and what is thus produced is obtained, from the point of view of the social economy, without sacrificing any other satisfaction of wants. This fact induces people to accept public works as a means for overcoming the crisis, even if they are otherwise alien to a belief in any form of socialism as being something desirable in itself.

Against the increased activity in economic life that may be attained by the aid of public works we must, however, put the further crippling of private enterprise that may ensue if the government (or local bodies) enter on business activity. Private enterprise may find itself placed at a disadvantage by enterprise undertaken or subsidized by the government. Such, for instance, may easily be the result of utilizing public money for the construction of houses or for subsidizing such construction. Similarly, private enterprise may see itself threatened if the government intervenes in order to help private business involved in difficulties and thereby deranges the natural conditions for competition in efficiency. Further, state enterprise may have the consequence that certain wages are maintained on an uneconomic level, that is to say a level incompatible with equilibrium in the social economy. Such action may obviously delay that restoration of equilibrium which is indispensable for

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overcoming the crisis. Finally, it must be observed that the provision of funds for public works must burden either the capital market or the taxpayers. This burden may become so oppressive that it acts as a serious check upon the development of private enterprise.

If we wish to draw up a correct balance sheet of the different results of public works for combating unemployment, these minus items must be booked against the plus items, and the balance struck. It is by no means unlikely that this balance will be negative. In the case of the United States in particular the experience hitherto accumulated seems to point in such a direction. In no case is it possible to look upon public works as any lasting solution of the task before us—at any rate not so long as this task is understood to be to attain such an increase in the activity of *private* business as will restore to our productive forces reasonably complete employment.

A curtailment of saving and an extension of public works are the main points in the policy of expansion that have attracted the chief attention in different countries during the present crisis. In both these points, however, the policy of expansion is determined by a false or at any rate an incomplete comprehension of the conditions that must be fulfilled if economic progress is to be based on private enterprise. It is obviously impossible definitely to cure the crisis by

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measures that relieve symptoms, but which in a deeper sense are contradictory to the said conditions. The depression is in its essence an abnormal reduction in the activity of private economic life, and it can only be definitely overcome by a removal of the factors that have caused the paralysis.

Among these factors the most important one is no doubt the general fall in prices. We have to do here with a process of deflation, that is to say with a phenomenon that is of a purely *monetary* nature, and which can therefore be combated only with monetary measures. The acknowledgement of this truth does not prevent a further analysis of the crisis with a view to clearing up the different disturbances of *other* kinds that may co-operate in bringing about an abnormal reduction in the activity of economic life.

Among these disturbances we must reckon a failing equilibrium between different groups of prices, for instance between wages in sheltered industries, such as the building trade, and wages in those industries that have to face international competition, particularly wages in agriculture. In the present depression political disturbances also play an essential part. Such disturbances were behind the collapse of the world's monetary system in 1931, which since then has been the dominant factor in the present crisis. Political disturbances are still making themselves felt in the form of a vague fear of war. A more permanent

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political factor of disturbance is, however, the incessant interference of governments in economic life, and specially that sort of such interference which manifests itself in the destruction of international trade. It is the extraordinary insecurity in the conditions which governments nowadays offer to private economic activity that more than anything else ruins confidence and hampers enterprise.

In spite of all the difficulties that have been placed in its way, private enterprise has shown such toughness and vitality that it does not seem unreasonable to assume that it would quickly restore our economic life to full activity, were it only to recover a reliable monetary basis and something like normal liberty of action. In any case, such a heightening of the activity of the social economy seems to be the only solution of the problem of the world's crisis that is compatible with a right analysis of the causes of the crisis as well as of the normal way of functioning of our present social economy.

## V

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**E**CONOMIC life is, particularly under modern conditions, a very complicated phenomenon which must at first sight give a rather bewildering impression. Any one who wishes to understand what is really going on in the social economy is bound first of all to form some idea of what is most essential with regard to facts as well as to lines of development and causal connexions in this economy. Thus we have to begin our study of economic life with a *simplification*. This means that we deliberately neglect what is of minor importance and concentrate our attention on such a representation of reality as brings out its most fundamental features, and does so in such a way that we get a comprehensible and logically consistent conception of the social economy.

Such a simplification we call *Theory*. Theory therefore is not only the concern of some few scientific men detached from practical life and generally supposed to be strangers to it. Everybody interested in economics has a similar desire, and indeed imperative need, for simplification, and consequently for some form of economic theory. The human mind is simply incapable of grasping at once a complicated process as a whole. We must first form an elementary conception

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of the process and consider further details and complications in their relation to this conception, i.e. as deviations from or additions to our first summary representation of what is going on. This holds true even after we have acquired a more complete knowledge of the process.

Of course simplification always involves a choice. We have to select what is most essential and what should be included in our elementary representation of economic reality. This selection requires a certain amount of sound judgement which must be based on a broad knowledge of actual economic life. There may sometimes be different opinions as to what is most essential. In our further investigations, however, we shall always have to consider matters which were left out of our first survey as being of secondary importance. Thus the process of simplification does not mean that anything of significance is definitely excluded. It only affects the order in which different matters are taken into consideration. But, naturally, the choice of this order greatly influences the scientific and educational value of our exposition.

It is important that people should realize that simplification is the essence of theory. If this were generally understood, the difference between 'Theory' and 'Practice' would not be so unduly emphasized as it often is. Simplification is required also for practical purposes. It is indeed impossible to discuss any prac-

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tical question of a social-economic nature without eliminating—at least to begin with—many circumstances and connexions which may be supposed to have only remote and negligible influence on the actual question under consideration. People who believe themselves to be very ‘practical’ and who want to see things from a ‘purely practical point of view’ are nevertheless obliged to construct some form of theory for their own use. But, being unconscious of what they are doing, they usually make a bad theory which easily misleads their judgement, particularly if they are confronted with a situation of which they have had no previous experience. Thus economic science should be of great value in guiding popular attempts at simplification, and representatives of this science should so handle their task as to enable them to convince practical men of the real value of good theory.

The other side of the process of simplification is a subsequent gradual approximation to a true representation of real economic life. If the first simplification must predominantly have the character of abstract theory, every succeeding step will require a closer observation of real economic life and the use of systematically collected information, preferably in statistical form. It is only natural, therefore, that the whole investigation should gradually change its methods as it approaches reality.

It is sometimes thought that it would be better to



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proceed in the opposite direction, that is to say, to begin with the collection of statistical material and then from that material to try to arrive at more general conclusions. It is hardly possible, however, to collect information about economic life in any systematic way without starting from some simplification of the questions to be studied and from a theory analysing and exactly formulating these questions and introducing the necessary definitions. For this reason, to proceed from theoretical simplification to a subsequent gradual approximation to reality is doubtless the only way practically open to general economic research. This statement does not of course exclude the possibility that a scientific analysis of statistical curves, or of other data representing 'behaviour', may be of great value as a source of knowledge and as a guide to general theory in finding out and stating the questions it has to answer.

If theory means simplification, it follows that actual life must always show deviations from the results obtained by theory. People are often inclined to look upon such deviations as errors proving the wrongness of the theory. This is a mistake. The theory has deliberately left out details of secondary importance in order to concentrate on essentials. For this reason reality is bound to show deviations from theory. Such deviations only prove that our theory is not yet a 'complete representation of reality. If further examina-

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tion brings out the existence of some important and perhaps typical deviations, we shall be forced to find out the explanation of them and thus to widen the scope of our theory. In this way we shall gradually approach a true representation of actual economic life—without ever being able definitely to reach that end.

What really matters is, first, that our theory should in itself be logically consistent and, further, that it should take into account what is most essential in the problem before us and be so constructed that it is possible for us afterwards to introduce new elements into the theory without being forced to pull down the building already erected. These are the true criteria of a good theory. Deviations of actual facts from the results of the theory are nothing to worry about. They should only serve as a guide for further investigations. But as such a guide a quantitative statement of the deviations is invaluable. In particular it should be observed that the deviations can never be found out or measured, and cannot even logically exist, until an essential state of things or an essential development has been recognized, from which the deviations take place.

If we desire to form an elementary conception of social economic life as a whole, it is best to start from the very simple assumption of purely static conditions,

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where everything remains unaltered and the whole economic system has attained a definite equilibrium. The study of such a conception of economic life gives us the best opportunity for establishing with full clearness some fundamental principles of economics. On the other hand, this simplification goes so far that it prevents us from observing and examining some very important features of economic life such as saving and growth of real capital. It is necessary, therefore, even at an elementary stage, to introduce into our investigation the elementary features that relate to economic progress. Progress, however, in the general sense of the word, is a very complicated phenomenon, and we must be content in the first stage of our research to examine the most simple case, namely, the economy of a *uniformly progressive society*.

As soon as we have to do with a growth of any kind, this concept of uniform development represents a necessary simplification from which further research must start. Irregularities in the development can indeed only be described as deviations of the actual development from a uniform development with a rate of growth corresponding to the average of the actual growth for a certain period. If, to take a very simple example, the average rate of growth of the population in a country during a century has been equal to 1 per cent. a year, the actual growth of this population can only be described as deviations from

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such a uniform growth. This uniform growth is then regarded as *normal*, and we may speak of periods of super-normal or sub-normal growth. Such expressions as a 'rapid' or 'slow' growth of population have no meaning until they are referred to a growth that is accepted as normal. The idea of a normal growth in fact underlies all popular ideas about a development or its irregularities. The first object of quantitative analysis must therefore always be to determine what growth we should accept as normal for the period under consideration.

When this has been done we are able to state that deviations take place, and we have a possibility of measuring these deviations. Then we may begin to examine the causes of the deviations as distinct from the forces behind the general uniform growth. In the example chosen we may make a definite distinction between those forces which cause a uniform growth of the population and those which disturb this uniformity and result in periods of super-normal or sub-normal growth.

The same holds true with regard to any economic development: we must start from the concept of a uniform growth, and the actual development must be characterized by certain deviations from this uniform growth. Further scientific research must be concentrated on these deviations and their causes.

The introduction of the concept of a uniformly

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growing social economy substantially simplifies the exposition of general economic theory. Experience shows that the essence of such important features of economic progress as saving and growth of real capital can never be grasped with full distinctness as long as they are considered in connexion with the very complicated dynamic conditions of actual economic life. The uniform development is an intermediary stage between static and dynamic conditions, and the analysis of this stage allows us to study the elementary features of progress in their simplest and purest form. It is theoretically, but still more pedagogically, impossible to enter upon the study of dynamic conditions until we have made ourselves perfectly familiar with the elementary theory of uniform progress. My *Theory of Social Economy* is based upon this principle of exposition, and my whole experience as teacher in economics has confirmed my view as to its value.

The general method of gradual approximation to a true representation of reality, which is the essence of economic theory, is best illustrated by an examination of some particular problems which play a predominant part in economic science. Let us first consider the problem of 'the Business Cycle'. It is often said and widely believed that there is some mystery in the wavelike movement of the business cycle, and that it is a paramount task of economic science to find out the

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hidden power behind this mysterious movement. This way of looking upon the 'riddle of the business cycle' has been very misleading and has proved a serious obstacle to a more natural and more fertile treatment of the problem.

During a long period of fairly undisturbed conditions production will show a certain average rate of annual progress. Statistical data will help us to ascertain this average percentage of growth, which may be looked upon as characteristic of the period as a whole. No organic growth can, however, be expected to be so regular as to present a strictly mathematical uniformity. The actual development of production during the period must show deviations from that uniform development which represents the average growth. The volume of production must stand sometimes above and sometimes below the curve representing the uniform development, and these deviations above and below the uniform curve must necessarily follow one another alternately. This is an inevitable consequence of the fact that we started from the consideration of a uniform development representing the *average* of the actual development. The fact that economic progress presents itself in the shape of a wavelike movement has therefore nothing mysterious about it, and in reality the so-called 'riddle of the business cycle' simply does not exist. Naturally we must examine the factors that in any particular case cause

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a rise or a fall in the business curve and try to find out what characteristic features these movements may have in common, letting them stand out, to a certain degree, as a repetition of one and the same movement and as the result of the same general causes. This examination should also explain why the ups and downs do not follow upon one another as instantaneous fluctuations but take the character of periods of prosperity and depression, usually so long as to give the whole curve the appearance of a sequence of waves. But the very question why the actual development should follow a curve composed of successive ups and downs is not a problem that requires an answer, such a movement being simply a self-evident necessity. In this sense there is no such thing as a 'general problem of the business cycle'.

The rational examination of what is called the business cycle is only an example of our general method of gradual approximation to a true representation of reality. In the first stage general economic development is represented by a uniformly rising curve showing a rate of progress equal to the average rate of progress during the period we are considering. If we trace the pre-war development back for the period for which sufficient statistical data are available, say for about half a century, we find that production in the world of Western Civilization has grown at an average rate of roughly 3 per cent. per annum, and that the

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actual development has strikingly followed the uniform curve representing such progress, the deviations from this curve being for the most part comparatively small. This steadiness of progress is in itself a very remarkable fact for which we must find a definite explanation. The fundamental agent behind the uniform growth of social economy is no doubt the stability of the aggregate degree of saving in a society based on private property.

In the next stage of our gradual approximation we have to examine more closely the deviations from this uniform development. As has already been said, such deviations may show some typical features which we shall have to study in order to find out whether there are some common causes behind them. However, this investigation is only possible if we confine ourselves to a period during which economic life has, broadly speaking, developed under the same general conditions, and in which this development has not been interrupted by extreme disturbances. Such is the period from the Franco-German War in the beginning of the seventies up to 1914. The succeeding Great War involves such a radical revolution of all conditions of economic life, and particularly of the monetary system, that we have no right to postulate any continuity in the economic development of the post-war and pre-war periods. Nor can we expect to discover any characteristics of the wavelike movements of trade



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in the post-war period until more stable conditions have been reached and we are able to survey some decades of economic development under these new conditions. For this reason an examination of the characteristics of the wavelike movement that is usually described as 'the business cycle' must be confined to the pre-war period from 1870 to 1914. An extension of the study backwards is largely prevented by the lack of statistical figures comparable to those which we possess for later years. In my *Theory of Social Economy* I have examined the pre-war trade cycle on the lines here indicated. The general result is that the wavelike movement is essentially the effect of a continual struggle between the pressure for progress and the scarcity of the capital resources required for the constructive work in which progress must manifest itself. In this interplay of forces the rate of interest is an essential factor, and its fluctuations reflect the changes that the capital market is always exposed to in a progressive economy.

The analysis also shows that the deviations from the uniform development are quite considerably amplified by defects in the administration of the monetary system. The different phases of the trade cycle are regularly connected with processes of inflation or deflation, which must be regarded as independent factors aggravating the fundamental disturbances of the capital market.

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Thus, for the period under consideration, the second stage of our gradual approximation reveals that there are typical forces responsible for the wavelike movement of the general economic development. These forces, however, cannot be supposed always to work with the same degree of intensity. If only for this reason, the wavelike movement cannot be expected to possess any regularity, still less anything of that mathematical periodicity which a modern school has fancied that it can read out of the economic development curves.

Our gradual approximation must therefore enter upon a third stage, in which the separate characteristics of each wave have to be studied. The object of our investigation will then be, not only the variations in the intensity of the typical factors just alluded to, but also the occasional forces which play an important part in the development of each separate wave and give it its particular aspect. In fact, life always shows irregularities falling outside the general explanation of the economic development attained in the first two stages of our investigation. That this must be so becomes particularly clear if we observe to what extent this development is dependent on the acts of individuals in a leading position in the economic or the political field. What such individuals do or omit to do may be of the gravest importance for the entire social economy and cause disturbances in the eco-

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conomic development which cannot be included in any general theory.

For this reason, if not for others, 'Business Forecasting' is a rather hopeless undertaking. Not only is it generally impossible to foresee what is going to happen in the political world, but even in the more restricted field of pure economic policy, at any moment, decisions of the most far-reaching consequences may be taken which no 'forecasting' is able to take into account. For instance, it is obviously impossible to state in advance what the Governor of the Bank of England or the Federal Reserve Board, not to speak of the present political administration of the American system of money, are going to do in a certain situation. It may perhaps be possible, by accumulating statistical facts, to foretell with a certain degree of reliability how great masses of people are likely to behave under certain given conditions, the law of big numbers allowing us to eliminate individual and occasional influences. But economic and political power is in our days so much concentrated, particularly in the great empires of the world, that it is impossible to apply any such method for forming a judgement on what is going to happen. For these reasons the pretensions of Business Forecasting to be able to read out the destinies of humanity in statistical curves must be definitely rejected. Indeed, such pretensions are fundamentally immoral, if morality means recognition of responsi-

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bility. In so far as we are able to control economic development we must fully face our responsibility and cannot hide behind an assumed necessity of a regular continuation of business curves. The whole school of thought of which business forecasting is an expression has had a very harmful influence in so far as it has weakened the consciousness of responsibility, and thereby the power and the resoluteness to act and to direct the development of economic life. In the post-war period the paralysing influence of that variety of ancient Babylonian astrology that expects to forecast the economic development by aid of a microscopic analysis of mathematical curves has been particularly conspicuous.

What is known as the 'harmonic analysis' of statistical data has frequently been presented with such claims for scientific reliability as cannot but make the whole thing ridiculous. The mathematical analysis of a given development offers no definite evidence of its causes. Every actual development can be represented by a mathematical formula, and that with all wished-for exactitude. The mathematical formula need not therefore be an expression of any necessity in the course of the development, and still less can it be taken to prove that the future development will follow the same mathematical formula. Any continuation can be included in another formula representing the known data equally well.

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It should be especially observed that every actual economic development can be described as a sum of a number of mathematical wave movements. This sum can moreover be made to include any wave movement we like. Thus the mathematical analysis can never by itself afford conclusive evidence of the existence of a special wave movement as an integral part of a given development. Such a fact can only be proved by means of an economic analysis. Failing the necessary economic theory, no definite conclusions can be drawn as to the causes of development.<sup>1</sup> It is especially appropriate to emphasize these truths if the statistical data on which we have to base our investigation are relatively few in number. In such cases the mathematical analysis is most easily misleading, and a strict observation of the above remarks should lead to a definite rejection of many results of this analysis that are now given out to be economic science. Here, indeed, we have a case in which everybody must realize what an urgent need there is for the better equipping of economists for handling quantitative problems. A mere acquaintance with the use of some technical methods of mathematical statistics is by no means sufficient for the education of an economist in quantitative thinking.

This account of what can be attained by the method of gradual approximation in the analysis of the general

<sup>1</sup> See my paper, 'The Problem of Business Cycles', *Skand. Kredit AB's Quarterly*, January 1933.

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development of social economy is a good illustration of the usefulness of the method. It excludes subjective views arbitrarily formed in advance, and it makes the different agents in the development stand out in their right place and in their true relative importance, thus safeguarding us against all sorts of one-sided and dogmatic theories. An investigation carried out on the lines of gradual approximation is in its scope wide enough for the whole reality of economic life and can therefore never be sorted into any of those pigeon-holes into which systematic classifiers are so eager to place the different theories of the business cycle.

It should particularly be observed that, for reasons given above, our analysis is confined to the period from the beginning of the seventies to the outbreak of the Great War. During this period the world's monetary system possesses a certain, although by no means complete, stability. In contrast hereto the post-war period is primarily characterized by violent monetary revolutions with the most far-reaching and fatal influence on the general economic development. Thus the results of our analysis of the former period cannot be expected to be valid for the latter period. Indeed, post-war development requires an entirely new investigation. If other results are then obtained that is no reason for charging the investigator with being self-contradictory, and it cannot be admitted that to take into account new facts involves the adoption of a 'new theory of the

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business cycle'. The investigation has simply followed, during different periods of economic development, the same logical procedure of gradual approximation.

Let us now consider another important application of the method of gradual approximation, namely, an analysis of the movements of the general level of commodity prices. In this case it is particularly obvious that the analysis must be confined to a period in which the general system of money has been essentially unaltered. For this reason we cannot extend our analysis farther than up to the Great War. With regard to the character of the statistical material available, the investigation can hardly begin much earlier than at the middle of the nineteenth century. During the period between these limits Great Britain was on the gold standard and, in addition, was essentially a free-trade country. British prices, therefore, may be taken fairly well to represent gold standard prices in the world market, and British index numbers to reflect the variations of the general price-level in terms of gold. On the basis of fairly reliable statistics we can draw a curve representing these movements for the period 1850-1910.<sup>1</sup>

<sup>1</sup> My first investigation in the subject was published in *Ekonomisk Tidskrift*, Uppsala, 1904. The full results are given in my *Theory of Social Economy*, London, 1932. For a concentrated exposition see my memorandum on the subject in the First Interim Report of the Gold Delegation of the League of Nations, Geneva, 1930.

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An analysis of this curve must naturally begin with the question of how far the price-level has been influenced by the *supply* of gold. The statistics of gold production show that the world's total stock of gold grew throughout the period with remarkable uniformity, and that in 1910 it reached a level 5.2 times as high as that of 1850. Thus the stock of gold is multiplied annually by the factor 1.0278. This means approximately a growth at the average rate of 2.8 per cent. per annum. A uniform growth of the gold stock at this rate during the whole period is the essential feature of the gold supply during that period. The actual development of the gold stock, however, shows secular deviations from this uniform curve, the gold stock being somewhat higher during the time 1850-83 and somewhat lower from that year up to 1910.

Now, the general price-level in terms of gold was in 1910 practically the same as in 1850. For the whole period, therefore, the gold supply was sufficient to keep the general level of gold prices at an unaltered height. Had the growth of the gold stock been strictly uniform, the supply of gold could not be regarded as having caused any alteration of the price-level. The supply of gold would have completely balanced the increased demand necessarily connected with the general economic development in the period. A curve showing such a uniform growth of the gold stock may therefore be taken to represent a normal gold supply.



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The actual supply may be compared with this normal supply, and such a comparison will enable us to calculate the quotient between these quantities, for which I have introduced the name 'relative gold supply'. This relative gold supply shows deviations—of the character already described—from a constant level of, say, 100. Only these deviations can have an influence on the general price-level, and we are able to construct the price-curve representing this influence. Comparing this curve with the actual price-curve, we can see how much of the variations of the price-level has to be attributed to variations in the gold supply. Thus we have arrived at the *first* approximation in our investigation of the factors underlying the movements of the general price-level.

The analysis, however, shows that a part of these movements remains to be explained by other causes. The *second* approximation to a complete explanation is reached by a study of the most important of the known variations in the *demand* for gold.

In this way we are able to explain with practical completeness the *secular* variations of the price-level during the period. It remains to explain the *short-time* fluctuations of the price-level. It is immediately seen from our curves that these fluctuations are connected with the trade cycles. They have nothing to do with the gold supply, but are caused exclusively by variations in the supply of those means of payment that are

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created by the banks, i.e. bank notes and deposits, and in the intensity of the use made of them.

In this way we arrive at a practically complete explanation of the movements of the general price-level. We have reached this explanation by a gradual approximation to a true representation of reality. We have taken account of different factors which may be assumed to exercise an influence on the general level of prices. We have tried to find a quantitative measure of the influence of each separate factor. Such influence can then be represented by a curve, and this curve can, so to speak, be subtracted from the curve representing the actual development. Proceeding in this way, we at last reach a stage where there are no more movements to be explained, the residual deviations from a straight line being so small that they fall entirely within the limits of error of our statistical material. This is the practical criterion of the completeness of our analysis. Of course there is always the possibility that the analysis may be refined and that other factors may be found which exercise a certain influence on the general price-level. But having regard to the results obtained by our method, such other factors must be of but little importance, or at least their influence must be largely counterbalanced by other influences not before taken into account.

In an article in the *Quarterly Journal of Economics* for August 1933 Mr. Phinney has tried to show that

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my investigation into the dependence of the general level of commodity prices upon the supply of gold must be entirely rejected. For this judgement he has advanced three different reasons. An examination of these reasons may be useful as throwing further light both on this particular problem and on the whole method of gradual approximation to a true representation of economic reality, which is the object of our present study.

The first of Phinney's reasons is that it should be impossible to state that the secular price-level has the same height at the beginning and at the end of the period considered. For such a comparison it is evidently necessary to eliminate at both points of time the short-time variations in the price-level clearly connected with the trade cycle. I have tried to do that in my investigation. Phinney believes, however, that the correction of the actual figures for the beginning and the end of the period must be determined by the *general* tendency of the movement of the price-level, that is to say, what is mathematically known as the 'trend'. This is doubtful, as such a tendency may be influenced by changes in the production of gold, and the main purpose of my whole investigation is to *separate* the influence of the supply of gold from other influences on the price-level. We know that the production of gold played a predominant part in the development of the price-level about 1850. The

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influence of this factor should not be mixed up with that of the trade cycle.

However, Phinney arrives at the result that the price-level of 1910 does not, as I have assumed, practically coincide with that of 1850, but is actually nearly 6 per cent. lower. When on this ground he rejects my whole investigation, he only shows how little he understands of the value and the reliability of the method. If the price-level had really fallen by 6 per cent. during the period this would mean that the gold stock at the end of the period ought to have been about 6 per cent. higher in order to keep the price-level at an unaltered height. How would such an error affect my calculation of the 'normal' rate of growth of the gold stock? Phinney would have been able to form an idea of this if he had taken the trouble to calculate how much  $\sqrt[60]{1.06}$  is. He would then have found a round figure of 1.001 or, in other words, that the error in my calculation of the multiplicative factor denoting the normal annual growth is about one per mille. Phinney thinks that the price-level of 1850 should be put at 84, and that of 1910 at 79. In order that the price-level might remain unaltered it would then have been necessary for the gold stock to be multiplied in the period, not by the factor 5.2, as said above, but by the factor  $\frac{84}{79} \times 5.2$ , that is 5.529. The factor denoting the annual growth would then have been 1.0289 instead of 1.0278, as I have found above, or, in other

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words, the annual rate of growth would have been 2.89 instead of 2.78 per cent. Such a small error obviously alters nothing in the essential results of my investigation and still less in the validity and usefulness of my method. It should also be remembered that, as pointed out above, Phinney has not been able to prove the existence of that error.

To his criticism on this point Phinney adds the remark that such an investigation cannot be based on any actual index number for wholesale prices, but that an index number comprising 'all prices' must be used. The only answer to make is that the purpose of this part of my investigation has been merely to find out how much the gold supply during the period has influenced the general level of wholesale commodity prices, as expressed by the series of index numbers used. If anybody would choose a price-level defined in quite a different way and believed to comply with the unreasonable pretension of representing 'all prices', he must naturally be prepared to find that such a price-level shows a somewhat different relation to the supply of gold.

The second main objection of Phinney's is that it would be impossible to ascertain what gold stocks should be regarded as normal for the beginning and the end of the period. This objection is based on a misunderstanding. The actual gold stocks are known, and the concept of a 'normal' gold stock' which I have

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introduced refers only to an imaginary uniform growth from the initial to the final gold stock. Whether the gold supply affects the price-level immediately or only after the lapse of some time is a question which Phinney wants to have discussed in this connexion, but which has nothing to do with the fixation of the concept of 'normal gold supply'. Obviously, this question can only be answered by comparing the curve of the general price-level with that of the 'relative' gold supply.

Easily refutable is Phinney's third objection, that my investigation depends on the assumption that the demand for gold grew at a constant percentage during the whole period. When such an objection is raised, one can hardly believe that the author has actually read the whole exposition of my investigation. In any case he has entirely failed to understand what the goal of the investigation has been and how the analysis of the problem has been constructed. My first aim has been to find out how much of the variations of the price-level can reasonably be ascribed to changes in the supply of gold. The result is that the secular variations of the price-level, to the extent shown by my calculation, must be regarded as caused by irregularities in the supply of gold. The rest of the said variations must be attributed to certain definite and well-known changes in the monetary demand for gold. In addition, I have shown that the short-term varia-

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tions of the price-level have nothing to do with the gold supply. When the analysis has been carried through along such lines, and has led to such results, it seems rather unreasonable to criticize this analysis on the ground that it should have presupposed a uniformly growing demand for gold, or, as several critics have done, contend that I started from an *a priori* assumed coincidence between price-level and gold supply, and that the non-existence of such a coincidence demonstrates the complete futility of my method.

In our analysis of the movements of the price-level we began by designating a constant price-level for the period 1850 to 1910 as normal. In respect of the main factors determining this price-level, namely gold supply and demand, a uniform growth during the whole period at a certain annual percentage corresponding to the average percentage of the real growth was designated as normal. Such normal developments would together have had the 'normal' effect of keeping the general price-level constant—provided, of course, that no disturbances were caused by other factors. In any case, a factor is responsible for deviations in the result only in so far as it deviates from its own normal course.

This analysis shows the method of procedure we must adopt when we wish to attribute definite portions of influence to different factors co-operating in a given

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movement. The possibility of a solution of this problem depends entirely upon the possibility of designating certain developments as 'normal'.

The problem of attribution is in itself logically undetermined. Generally the movement of one factor may be balanced by a suitable adjustment of other factors. If the first movement is counteracted in this way it will have no effect on the final result of the co-operation of the several factors. For instance, if an extraordinary increase in the stock of gold, say by 1 per cent., is counterbalanced by an equal extraordinary increase in the demand for gold, the general price-level will remain unaltered. On the other hand, if the increased supply is followed by a rise of the general price-level, this rise may be ascribed to the fact that demand has not been raised so much as to balance the increased supply. The logical nature of the problem does not allow us to state generally that a certain movement in the combined result of co-operating factors is caused by a particular factor, or in what way the responsibility for the movement should be divided up between the different factors. It is only when we have accepted the idea of a normal movement of every particular factor that the problem of attribution becomes determined.

The possibility of counteracting a movement in one factor by a suitable adjustment of the other factors is no mere theoretical construction. Until we have found



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some definite means of distinguishing between independent and merely counteracting movements; it is impossible to classify any movement of a factor as responsible or not responsible for movements in the composite results of all co-operating factors.

If one factor is under the control of human will, and if this control can be so exercised as to prevent movements of other factors from influencing the combined result, the responsibility for an undesirable movement in that result must be laid entirely on the controllable factor. It ought to have been possible, by a suitable adjustment of this factor, to counteract those movements of the other factors that had brought about the undesirable movement in the final result. The recognition of this principle is of fundamental importance for practical policy. No responsible direction of any side of public economic activity could exist if human control were not held responsible for the counteraction of all influence that it can counteract and that ought, in the interests of the community, to be prevented from exercising any influence on the final result.

In my Rhodes lectures at the University of Oxford<sup>1</sup> I applied this principle to the question of the responsibility of the policy of central banks for the disastrous fluctuations that have taken place since the War in the

<sup>1</sup> *The Crisis in the World's Monetary System*, Rhodes Memorial Lectures, Clarendon Press, Oxford, 1932.

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purchasing power of money. On that occasion I pointed out the parallel case of the navigator of a ship who, in spite of all the influences of winds and currents, must be held responsible for the course of the ship, simply because such adverse influences may be counteracted by skilful navigation. The general recognition of this principle in public affairs is an essential moral necessity.

NOTE. While this book was in proof I received an article by Allan G. B. Fisher in the *American Economic Review*, June 1935, on 'Volume of Production and Volume of Money', containing a criticism of my investigation into the causes of alterations in the value of gold. This rather confused criticism is based on a mistaken view of the purport of my investigation and should be met—at least in the chief points—by the above re-statement of the application of the method of Gradual Approximation to the problem.

## VI

### QUANTITATIVE RELATIONS BETWEEN PRODUCT AND FACTORS OF PRODUCTION

THE total net result of the process of production in any self-contained community must necessarily depend upon the available quantities of the different factors of production, and economic theory has shown much interest in a simple quantitative representation of this dependence, preferably by means of a mathematical formula. I shall try to explain here, in as elementary a form as possible, how economists have been led to construct such a formula. The most simple solution seemed to be to represent the economic product as an arithmetical product of the available quantities of the different factors of production. But as a certain relative increase in one factor, without any increase in the other factors was thought to cause a smaller relative increase in the result of the co-operation of all factors, each factor had to enter into the arithmetical product with a certain exponent, smaller than one. If, for instance, one factor is doubled whereas the other factors remain constant, it was held that the social product would not be doubled but only multiplied by, say, the square root or the cubic root of 2, or more generally by  $2^n$ , where  $n$  is some fraction of 1.

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The exponent to be attributed to each factor obviously depends on its efficiency in increasing the social product by being itself increased but left without the aid of an increase in the other factors.

If this efficiency is high, the factor must be given an exponent closer to 1; if it is low, the exponent may be a small fraction of 1. Thus the exponents must represent in a certain sense the effectiveness of the different factors of production. These considerations lead to the following solution of the problem. Let us denote the total product in a self-contained community by  $p$ , the available quantities of the several factors of production by  $x, y, z$ , and the exponents attributed to them by  $u, v, w$ . The dependence of the product on the factors of production would then be expressed by the following formula:

$$p = x^u y^v z^w. \quad (1)$$

(If  $p$  as well as  $x, y, z$  are expressed as index numbers the equation must be written as it stands, i.e. without any constant factor.) The formula was further simplified by the assumption that

$$u + v + w = 1,$$

meaning that, if each factor of production is multiplied by one and the same number, the social product is likewise multiplied by that number. Moreover, the very arbitrary assumption was made that the exponents could be regarded as constants, i.e. as independent of

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alterations in the relative supply of the different factors of production.

The formula thus arrived at was not only considered adequate to express the dependence of the social product upon the supply of the different factors of production, but was also asserted to be the natural basis of the theory of distribution, which was regarded simply as a mathematical deduction from the above formula. To prove this it was deemed sufficient to calculate the partial differentials of the product with regard to the different factors of production:

$$\begin{aligned}\frac{\partial p}{\partial x} &= \frac{up}{x} \\ \frac{\partial p}{\partial y} &= \frac{vp}{y} \\ \frac{\partial p}{\partial z} &= \frac{wp}{z}.\end{aligned}\tag{2}$$

From these equations it follows that

$$x \frac{\partial p}{\partial x} + y \frac{\partial p}{\partial y} + z \frac{\partial p}{\partial z} = p(u+v+w) = p.\tag{3}$$

The economic translation of the last equation is that the total product is equal to the sum of the quantities of the factors of production, each multiplied by its marginal product. This seems to be a very simple and fine solution of the problem of distribution. Every factor receives its share of the total product according to a compensation determined by its marginal pro-

ductivity. In fact, economists brought up to believe uncritically in the theory of marginal productivity regarded this doctrine as a fundamental and almost self-evident truth from which all further investigation of social distribution had to start. When the doctrine was referred back to a formula representing the dependence of the social product on the factors of production and corresponding to our first equation, this was probably done in the belief that the doctrine could thus be made still more reliable. It must, however, be remembered that the result suffers from precisely the same amount of arbitrariness as we have found to characterize our first equation.

Generations of students have been brought up to believe in the general correctness of the theory of marginal productivity and of the solution of the problem of distribution based upon that theory. One point, however, proved to give rise to some trouble. It seemed difficult to find any place in this solution for the entrepreneur's profit. On this point a long controversy developed, of which a review is given in Joan Robinson's article 'Euler's Theorem and the Problem of Distribution' (*Economic Journal*, September 1934). Here we have a striking example of the incredible degree to which economic theory has allowed itself to be entangled in difficulties which in fact it has itself created by adopting more or less arbitrary mathematical formulae, connected with doubtful

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quasi-mathematical calculations, and by not giving sufficient attention to the economic realities that should be represented by such mathematical symbols.

In the present case every step of the deduction is open to serious criticism.

Let us begin with the last equation and consider more closely the concept of marginal productivity and its use as a basis for the theory of distribution represented by this equation. We have then first to observe that a marginal productivity can be constructed only in those cases where the amount of a factor of production can be varied continually, and where the product itself may be regarded as a continuous function of this variable factor. In economic reality this is by no means generally the case, and for this reason alone it is inadmissible to base a general theory of distribution on the concept of marginal productivity. The entrepreneur's contribution is particularly an indivisible factor for which a marginal productivity can hardly be calculated, and this is one of the causes of the difficulties which the theory has met with in finding a place within its framework for the entrepreneur's profit.

However, the impossibility of building a theory of distribution on the concept of marginal productivity lies deeper than that. The whole endeavour to construct such a theory is determined by a mistaken view attributing to the Principle of Substitution a funda-

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mental role in the system of economic equilibrium. As I have shown in my *Theory of Social Economy*, the fundamental principle in the theory of prices, and therefore also in the theory of distribution, is the Principle of Scarcity. In relation to this principle the principle of substitution has only a secondary position as one of the supplementary principles serving to determine costs of production in cases where these are not technically fixed. Any attempt to solve the general price problem without recognizing the fundamental position of the principle of scarcity is doomed to failure. The way in which prices are fixed can be represented only by a system of simultaneous equations, such as I have used in my *Theory of Social Economy*. The same of course holds good with regard to the problem of distribution. Any formula that pretends to give a simpler solution, independent of that system of equations and of the principle of scarcity for which it is the expression, is essentially misleading. The different factors of production have a price principally because of their scarcity and would have a definite price even if there were no technical possibility of substituting them for one another in the process of production. Distribution, therefore, fundamentally depends upon the relative scarcity of the different factors of production and is only to a certain degree modified by the conditions under which these factors in some cases may be substituted for one



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another. This is the deeper reason why the solution represented by our last equation must be inadequate and misleading.

The concept of marginal productivity is originally based on the consideration of a process of production in which only one commodity is produced and in which, therefore, the result of the process is a measurable quantity. If the result of the production is a number of different commodities it can be considered technically as a measurable quantity only if these commodities are combined with one another in technically fixed quantitative relations. Generally, of course, this is not the case. If we consider the whole social process of production, the total product is a great mass of different commodities and services of the most varying nature and there is no technical possibility of expressing this mass as a measurable arithmetical quantity. Only if the different commodities and services have definite prices may the value of the total product be expressed in terms of money. The mass thus becomes a measurable arithmetical quantity. Thus it is impossible to speak of the marginal productivity of any factor in the great social process of production except when the prices of the different factors are assumed to be known. But in this case the marginal productivity of each factor is simply its own price. It is impossible, in considering the total social process of production, to attach any meaning to the concept of marginal

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productivity of a certain factor of production other than its price.

Now, in a state of equilibrium the price of the total social product must naturally be equal to the sum of the factors of production, each multiplied by its price. In a study of the problem of social distribution the equation (3) can have no other meaning. It expresses a self-evident truth, and it is impossible to draw from that equation any particular conclusions with regard to actual distribution. The equation merely tells us that every factor of production gets a share in the total product according to its price. The great controversy about the true meaning of this equation is therefore senseless. The problem of distribution can never be anything but the general problem of the formation of prices in the social economy, and this problem can only be represented by the system of simultaneous equations referred to above.

Further, if equation (3) does not mean anything beyond what has been explained above, it is obviously impossible from that equation to draw any conclusions whatever as to the dependence of the social product on the supply of the different factors of production or as to the form of the function representing general economic progress.

Let us now turn to our first equation. Even if we accept its general form, it may be questioned whether the sum of the exponents actually equals 1. As we have

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seen, this assumption means that doubling of the supply of each factor of production would double the product. There is not the slightest support for this assumption in what we know about real economic progress. If we had two identical economies and if we added them together we should obviously have a case in which the doubling of all factors of production would double the product. In real economic life, however, progress is a far more complicated process, involving a steady increase in efficiency. An equal growth in the supply of all the different factors of production will regularly be accompanied by a better application of them. In fact, this is a normal condition of the growth itself. Particularly, an increase of the population widens the scope for the 'Division of Labour' and for a more effective organization of production. This will allow the use of machinery of greater efficiency, and such machinery will be invented. Thus the whole process of production will be transformed, and the relative increase of the social product will be larger than that of the factors of production.

In reality the different factors of production do not grow in the same proportion. We have found (Ch. III) that an average rate of progress of about 3 per cent. a year is characteristic of the Western World during the half-century preceding the War. As far as can be ascertained, both capital and income grow at this average rate. The population, however, shows a

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very much smaller increase, mostly less than 1 per cent. per annum. In a quarter of a century, therefore, the capital of the community has, roughly speaking, doubled, but the population has only increased by, say, a fourth. This growth is, however, sufficient for doubling the income of the society. Thus, this typical form of progress shows a radically different aspect from that assumed by the theory here criticized. For some countries, as e.g. the United States, the general rate of economic progress is higher. The growth of population is also more rapid, but still much slower than that of capital and income.

Nowadays everybody knows that actual economic progress in the Western World has corresponded broadly to the figures just quoted, and that, in spite of temporary fluctuations, it has been characterized by a striking regularity. Nevertheless, we find theoretical discussion of the problem of distribution continually proceeding on quite another assumption. Surely this is a state of affairs that ought not to be tolerated in a modern science aiming at the closest possible representation of reality.

When our first formula has been taken as a solution of the problem of distribution it seems mostly to have been looked upon as representing the situation at a certain moment, and little attention has been paid to the question whether the formula truly reflected the actual development of social economy during a

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certain period. It is impossible, however, to ignore this side of the problem. If our equation (1) is to represent the development of production during a certain time, one must generally be prepared to see its exponents  $u$ ,  $v$ , and  $w$  vary during that time. As the different factors of production grow at a very different rate, the relation between their quantities will have changed considerably after some years. Naturally, this alteration must be expected to have an effect on the exponents with which the factors enter into the function representing the total product. Thus, generally, our exponents  $u$ ,  $v$ , and  $w$  must be variables depending upon  $x$ ,  $y$ , and  $z$ .

From the equations (2) it follows that

$$u = \frac{x \frac{\partial p}{\partial x}}{p},$$

&c.

This means that our exponents are equal to the relative shares of the several factors of production in the total product. Thus the assumption that  $u$ ,  $v$ , and  $w$  are constant leads to the result that the said shares remain constant during an economic development which involves great changes in the relative quantities of the different factors of production. Such a very remarkable result cannot be postulated in advance; its correctness could only be proved by a statistical

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inquiry into actual facts. Even if it should happen to be approximately true, the equation (1) from which this result has been deduced by doubtful mathematical operations cannot claim any validity. For, if the exponents  $u$ ,  $v$ , and  $w$  are variable, the calculation by which the third equation is derived from the first is no longer mathematically correct. The differential equations must then also contain differentials of  $u$ ,  $v$ , and  $w$  in relation to  $x$ ,  $y$ , and  $z$ , and thus become very complicated. For this reason it is impossible to regard equation (3) as a pure mathematical derivation from equation (1).

Thus the whole deduction, which I have tried to expound here in its simplest form, is theoretically defective and has no support in observations of actual economic life. It is difficult, then, to understand why intelligent men, having to face the great responsibilities of the modern economist, should waste their time in discussing such a purely hypothetical solution of the problems of economic growth and of social distribution.

Professor Douglas has taken up the long-term development of production as dependent upon the supply of different factors of production as a statistical problem.<sup>1</sup> He starts his investigation, or at least

<sup>1</sup> *Economic Essays in Honour of Gustav Cassel*, London, 1933; *The Theory of Wages*, New York, 1934.

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believes that he does so, in a purely empirical way. He assumes, however, that it ought to be possible to represent the development of production by an equation similar to our first equation, although he does not use more than two independent variables, representing Labour and Capital. He assumes his exponents to be constants and their sum to be equal to 1. He then proceeds to determine these constants by comparing his formula with a curve derived from statistical facts and reflecting the actual growth of manufacturing in the U.S.A. during the period 1899-1922. Using the method of least squares, he succeeds in determining his exponents in such a way that a close correspondence between the theoretical and the statistical curve seems to be established. (He makes a mistake in introducing into his equation a constant factor equal to 1.01. As the calculation is based on index numbers, there is obviously no place for such a factor.) As exponents for labour and capital he finds the figures 0.75 and 0.25, and from that result he draws very far-reaching conclusions. In particular, he thinks that he has proved that labour receives  $\frac{3}{4}$  and capital  $\frac{1}{4}$  of the combined product, and that in this way he has arrived at a solution of the problem of distribution. He finds these figures confirmed by the direct investigation into the income of labour and capital in manufacturing which was undertaken by the National Bureau of Economic Research in its study of

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*Income in the United States* (vol. ii, New York, 1922,  
p. 98):

Here, again, criticism must start from the observation that the exponents in the production function cannot be supposed to remain constant during a long period. There are strong reasons for believing that the exponents altered considerably during the period contemplated, in which capital grew so very much faster than labour. This view is confirmed by the figures arrived at by a similar investigation of the development in New South Wales. There the exponents for labour and capital are found to be 0.65 and 0.35 respectively, whereas a direct investigation of labour's share has proved it to be as low as 0.57. This difference between two countries in different stages of capitalistic development makes it very probable that there must be a similar difference between the situation in the United States at the beginning and at the end of the period.

We must therefore take it for granted that the exponents in Douglas's original formula—if this formula is to have anything to do with reality—are variables, dependent upon the relative supply of capital and labour at any given moment. But, if this is so, it is obviously inadmissible to calculate some average value of the exponents by applying the method of least squares to the statistical data. The purpose of this method is to determine the value of certain constants



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from observations which may involve some errors.. The method allows us—to a certain degree—to eliminate such errors in determining quantities which we know to be constant. But when a quantity is essentially variable there is no single value to be determined and no definite errors to be eliminated. Only if a formula for the movement of the quantity is known is it possible by mathematical-statistical methods to determine the most probable values of the constants entering into that formula. Even if Douglas succeeds by his method in establishing a satisfactory correspondence between his formula and the statistical data, this by no means proves that his exponents really are constants. They may be variables moving according to certain formulae and then these formulae could be determined in such a way as to give an equally good or perhaps an even better correspondence with reality.

Here we have an example clearly demonstrating how necessary it is for an economist using mathematical methods of calculation thoroughly to understand what such calculations really mean and what are the conditions under which they can be applied.

Further, if the exponents of the production function are variables dependent on the supply of labour and capital, then again the simple application of differential calculus, which Douglas makes, is impossible, and differential equations obtained in that way must be quite erroneous. Thus there is no foundation

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whatever for the solution of the problem of distribution which Douglas believes that he has found.

As already observed, Douglas's study is confined to manufacturing in the United States, and the results arrived at by such a study can have no validity for the economy of a community as a whole. If we wish to examine the general problem of social distribution, we are bound to study the entire economy of the community. Let us assume, in accordance with Douglas's theory, that the total production  $p$  of a self-contained community may be expressed by the simple formula

$$p = x^u y^v \quad (4)$$

where  $x$  represents labour and  $y$  capital, and where  $u$  and  $v$  are constants.

In such a community, however, the growth of capital is determined by the income of the community, taken together with its rate of saving. If the economy of the society progresses at a uniform rate, say by 3 per cent. a year, the annual growth of its capital will be 3 per cent. of the stock of capital already accumulated. This annual addition to the stock of capital must be equal to the annual saving, i.e. to the income of the community multiplied by the rate of saving. If this rate is constant and equal, say, to 15 per cent. of income—a figure that may be taken as a fairly representative example—we arrive at the result that 15 per cent. of the income is equal to 3 per cent. of the

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capital. Thus the total income is 20 per cent. of the capital of the community. Generally, in a uniformly growing economy both the rate of saving and the rate of growth of capital must be assumed to be constant. But then income is equal to capital multiplied by a certain constant, i.e. income grows at the same pace as capital. This connexion is of fundamental importance for our knowledge of the uniformly progressing economy, and any study of progress must start from this elementary assumption. (See Chapter II, p. 24, and my *Theory of Social Economy*, § 8.)

Professor Douglas has confined his investigation to the manufacturing industry of the United States. In such a part of the total economy of a country it is of course possible that capital grows faster than income. However, the figures at which Douglas has arrived doubtless exaggerate the rate of growth of capital. He reckons only with fixed capital<sup>1</sup> and leaves out the floating capital of the industry, which is a large part of the total capital, but which can hardly grow much faster than the product. If the technical process of production is shortened, and if transport is made more rapid and reliable, which is a very important side of modern technical development, the floating capital should decrease rather considerably in relation to the product.

It is, however, quite possible that the total capital

<sup>1</sup> *Theory of Wages*, p. 113.

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of manufacturing has grown faster than its product. But it is reasonable to assume that such super-normal growth has been counterbalanced by a slower growth of capital in other branches of the social process of production, such as agriculture and service. Douglas has certainly given no reason for abandoning the assumption of a proportionality in the growth of the community's total income and capital, which an elementary consideration of the formation of capital makes a natural starting-point for economic science.

Returning now to the representation of the total production  $p$  by equation (4), we must first observe that this quantity is identical with the income of the community. In our formula we shall therefore have to regard  $p$  as the income of the community, and, therefore, in a uniformly progressing community,  $p$  must be equal to  $y$  multiplied by a certain constant  $c$ , i.e.

$$p = c y. \quad (5)$$

Comparing our equations (4) and (5) we find that

$$c y = x^u y^v.$$

If  $u+v = 1$ , this last equation takes the form

$$c = \left(\frac{x}{y}\right)^u. \quad (6)$$

This means that  $\frac{x}{y}$  is a constant, i.e. that the supply of labour must always grow at the same rate as the

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supply of capital, which implies that there is no progress in the sense of a rise in individual well-being. Only under these very simple conditions is it possible, therefore, that the social product can be represented by the equation (4). In fact, any change in the quantitative relation between labour and capital will result in corresponding changes in  $u$  and  $v$ , and these exponents can therefore no longer remain constant. But if  $u$  and  $v$  are themselves functions of  $x$  and  $y$ , the representation of the total production by equation (4) loses its simplicity; indeed, it becomes extremely complicated. There seems to be no reason why we should endeavour to uphold such a formula when the meaning of it is no longer immediately clear.

After these critical remarks and negative conclusions, some few observations on the actual nature of economic progress should be added, helping us to form an approximately correct view of the general mechanism of progressive economy. Theoretically, the simplest case is of course that referred to above, in which the several factors of production and their combined result are all growing at the same constant rate, i.e. where the growth does not involve any other change in the process of production. The consideration of such an economy may be useful for clearing up some fundamental features of economic growth such as saving and increase of capital. However, as we have

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seen above, we come much nearer to reality if we consider an economy where both capital and income grow at an average rate of 3 per cent. a year, whereas population increases by only 1 per cent. a year. If population grows at a uniform rate it is natural to assume the relative composition of the population to remain unaltered and thus the supply of labour to increase at the same rate as the total population, that is to say, by 1 per cent. a year. This rate is only one-third of the rate that characterizes the growth of capital and of the income produced by capital and labour together, and therefore also only one-third of the rate assumed by the theories criticized above. Surely, theories that differ so widely from reality can have no claim upon our serious consideration.

A progress of the character here described is, of course, possible only when the average productivity of labour is continually increased. In our typical progressive economy the product per unit of labour shows an annual growth of something like 2 per cent., whereas the product per unit of capital remains constant. Such a development is, of course, entirely incompatible with a representation of the dependence of the social product upon the factors of production by our equation (1), where the exponents are constants whose sum is equal to 1.

We have already seen that if the rate of progress is 3 per cent., and if saving is 15 per cent. of income,

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income itself must be 20 per cent. of capital. If the average rate of interest is 5 per cent., capital receives an income equal to 5 per cent. of the capital, that is to say, a fourth of the total income of the community. If we have only to consider the two great factors of production, labour and capital, it follows that labour receives three-quarters of the total income, i.e. three times as much as capital. This result is the same as that to which the statistical analysis of income from manufacturing in the United States by the National Bureau of Economic Research has led, and which, as we saw above, according to Douglas's claim should confirm his calculations. Our figures, however, are only chosen as an example, and it will require far better statistical material than we now possess to arrive at figures more exactly reflecting real conditions. Nevertheless, as a guide for the necessary statistical research, our analysis of the connexion between product and factors of production should be useful, whereas the methods of Douglas must be directly misleading.

An ever-increasing productivity of labour is attained by technical progress and by improved organization. Such progress extends nowadays to all parts of economic activity. However, in different branches of production efficiency increases at very different rates. The growth of efficiency has been most conspicuous in some branches of manufacture, such as, for instance,

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the automobile industry. It is a widespread belief that manufacturing by aid of labour-saving devices continually reduces the demand for labour, and that, therefore, increased efficiency is necessarily accompanied by unemployment. This is a mistake. Actual developments show quite a different picture. An oft-quoted example is given by one of the great automobile factories, where the number of workmen required to build a car in one week has been reduced from 55 in 1922 to 8 in 1934. Thus six-sevenths of human labour have been saved; nevertheless the total number of workmen has increased from 3,200 in 1922 to 16,000 in 1934. Generally, the greatest increase in efficiency has taken place in the progressive industries, and these industries have at the same time been able to increase the number of their employees. The industries that have reduced their staffs are mostly backward industries, whose ability to increase their efficiency has been small.

A broad survey of the social economy may divide productive activity into three branches: agriculture, manufacture, and service. In a modern industrial country the number of persons employed in agriculture is continually falling, absolutely, or at least in relation to the population; in manufacturing it is growing at a rate roughly corresponding to the growth of population; in service it grows far more rapidly. On the whole, humanity has reached a stage at which



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it can satisfy its need for food with a comparatively small amount of labour, and where only an approximately constant part of the supply of labour is required for satisfying the rapidly growing needs for manufactured goods, but where, therefore, a steadily increasing proportion of the population can devote their efforts to service, satisfying a large and steadily growing variety of needs characteristic of civilized life in our time.

The British Ministry of Labour's Report for 1933 (London, 1934) gives the figures for insured persons in employment aged sixteen to sixty-four, from which some broad conclusions concerning this development may be drawn. We may, in accordance with the Report, classify fishing, mining and quarrying, manufacturing, building and contracting, as 'production' in a technical sense, and the remainder of the occupations as 'service'. We then find that the number of labourers employed in production in the decade from 1923 to 1933 has fallen from 6,870,000 to 6,449,000, that is to say, by 421,000. This decrease can, however, be explained by the extraordinary, and for Great Britain specific, contraction of coal-mining, in which the number of men employed has fallen by not less than 537,400. Thus the remaining 'production' shows an actual increase of 116,000. In striking contrast to this relative stagnation stands the tremendous growth of the number of persons employed in 'service'. The

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figures are 3,027,000 for 1923 and 3,936,000 for 1933. The increase is 909,000, that is to say, 30 per cent. of the number of persons employed in 1923.

The great increase of employment in service is explained partly by the tremendous growth of output in manufacturing, which has to be handled by transport and other service operations with a slower growth of efficiency, and partly by the introduction of new branches of service, of which outstanding examples are those connected with motor traffic and the telephone and broadcasting systems. In addition, old services are being continually improved with the effect that consumers are better catered for than was usual in earlier times. For instance, the private household gets its daily supply of food sent home on telephone order. Thus far retail trade offers a more valuable service than before, and this increase in value must, of course, be added to the social product. No doubt a great deal of rationalization is going on in service too. Even conservative private households steadily introduce new labour-saving devices. Thus the contribution of service to the total social product may grow even faster than the number of labourers employed.

Just as labour is distributed very unevenly between different branches of production, so also is capital. We have found that the total capital of the community must be supposed to grow at about the same rate as the total income. But the different branches of production

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probably participate in this increase of capital in different proportions. If the growth of capital in manufacturing should be found to be more rapid than the average growth, this might be compensated by the slower growth of capital in agriculture and in service, which seems a natural assumption. Although we have not sufficient statistical data to prove this assumption, it may explain why total capital does not grow faster than total income, as people who only look at the most capitalistic enterprises in modern automatic manufacture are inclined to believe.

If we compare particular branches of production we find extreme differences in the proportion between capital and product. The same is the case with regard to the proportion between capital and labour. The Ricardian assumption of a general proportionality between capital and labour is very remote from reality and must be rejected. The consequence is, as I have shown in my *Theory of Social Economy*, that Ricardo's whole cost-of-production theory of value must be given up. However, as we have now seen, the great variety of the relative need for capital in different branches of production does not prevent total capital from growing in about the same proportion as total income, although very much faster than total labour. There is no contradiction in these statements.<sup>1</sup>

<sup>1</sup> This disposes of the criticism which Dr. Iversen has offered on this point: *International Capital Movements*, London, 1935, p. 9, note 2.

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This exposition of the mechanism of progress is, of course, schematic, but it suffices to afford a broad idea of the nature of economic development in modern society.

There is no reason why such progress should cause unemployment. The idea that increasing efficiency must necessarily lead to a reduction in the number of labourers employed has no foundation. No doubt, contraction of employment in some branches of production always takes place. But this may be far more than counterbalanced by expansion in other branches. Normally, a progressive economy should be able fully to absorb the annual increase of labour. The tremendous amount of unemployment which we have had to face ever since the War is entirely a consequence of extraordinary disturbances, most conspicuous of which are the collapse of the world's monetary system, the wilful destruction of international trade by State interference, misdirected devices for helping the unemployed, and a narrow-minded, monopolistic trade-union policy. It is widely believed that the present crisis has proved that our social economy suffers from fundamental shortcomings particularly manifest in an inherent incapacity for employing a growing population, and this belief is exploited by an agitation aiming at a definite destruction of the so-called 'capitalistic' system. As a matter of fact, the social order has shown no such fundamental deficiencies. In spite of all its

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faults, the capitalistic system has secured to humanity a very rapid and, for long periods, wonderfully uniform progress, which also, so far as it depends on that system, has, broadly speaking, taken all available and useful labour into its service.

We have found that this progress is the result of a continual growth both of labour and capital at definite but very different rates. The widespread belief that the supply of either of these factors of production is superabundant, and that our social economy is inherently unable to make full use of them, is a fallacy that can only be explained if we observe that most critics of the social order completely neglect the conditions of *progress*. It is of great importance that everybody should acquaint himself with these conditions and acquire an approximately correct view as to the dependence of the social product upon the supply of labour and capital. In this respect a dogmatic economic theory of earlier times has been utterly misleading, and an approximately true conception of reality has been made possible only by recent statistical inquiries into actual facts and by a scientific analysis of the results.

American investigations in particular have contributed much to our knowledge of the nature of progress. The figures published by Professor Mills<sup>1</sup> with regard

<sup>1</sup> *Economic Tendencies in the United States*: National Bureau of Economic Research, New York, 1932.

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to manufacturing in the United States are particularly instructive. From them it may be calculated that in the thirty-year period 1899-1929 the physical volume of production (value added by manufacture) has increased by 3.86 per cent. annually. This increase has been made possible by an annual increase in the number of wage-earners of 1.67 per cent. and by an annual increase of output per wage-earner of 2.16 per cent.<sup>1</sup> As the rate of increase of the population between 1900 and 1930 was 1.61 per cent. per annum, manufacturing was able to increase its number of employed persons a little more than would correspond to the growth of population. This disposes of the popular idea that rationalization in manufacturing necessarily leads to an increased degree of unemployment.

The statistics of the incomes of American corporations show that competition has been so keen as to force down average profits to a minimum.<sup>2</sup> The benefit of the progressive rationalization has largely been transferred to the consumers. Rationalization has been intimately connected with large-scale production which is possible only when the market for the product may be extended to the broad masses of

<sup>1</sup> The figures published on this subject by the National City Bank of New York in their monthly report of September 1934 are faulty and misleading.

<sup>2</sup> National City Bank Report, September 1934 and March 1935, New York.

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the population, who must therefore be assumed to have got their due share in the magnificent progress of manufacturing industry.

Between 1923 and 1929 the average annual rate of progress in the physical volume of manufacturing production was, according to Mills,<sup>1</sup> 2.0 per cent. against 3.9 per cent. for the pre-War period 1899-1914 and, as we have seen, 3.86 per cent. as an average for the thirty-year period from 1899 to 1929. Other calculations show a somewhat more favourable result for the period of prosperity ending 1929, and, in particular, progress in the building industry was much higher. Anyhow, the widespread belief that the years 1923-9 marked a boom of extraordinary strength, which must necessarily end in disaster, has no support in reality (see Chapter III).

It is probable that the figure 3.86 per cent., here quoted for the average progress in manufacturing in the thirty-year period 1899-1929, fairly well applies to the entire social economy of the United States in normal times.

For comparison it may be noted that, according to a recent official estimate, the national income in Sweden has risen in the period 1913-34 in the proportion 100:199. These figures refer to the general level of wholesale commodity prices in 1913, allowance having been made for the subsequent rise of that

<sup>1</sup> Loc. cit., p. 290.

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level. The annual growth of the national income, estimated in this way, is about 3·3 per cent. In the same period the tax-value of real estate, similarly reduced, has increased by 3·5 per cent. per annum.

There seems to be no reason in fact why an economic system which has shown such a remarkable efficiency should be scrapped as useless.

Our analysis of the nature and the quantitative relations of typical progress under the rule of western civilization leads to a result radically different from the ideas prevalent a hundred years ago. According to Malthus's formula, the destinies of humanity were determined by a tendency of population to grow in geometrical progression, whereas the possibility of sustenance would grow only in arithmetical progression. Thus the growth of population would inevitably be checked by the difficulties in finding the necessary means for supporting the population. This picture is as remote as possible from the reality characteristic of modern civilization. Our investigation has shown that the means of subsistence, just as population, increase in geometrical progression, only at an annual rate perhaps three times as large as that of the growth of population. This growth is by no means hampered by the urgency of any scarcity of the means of subsistence. On the contrary, the annual growth of production is so great that only a third of it needs to be



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used for supporting the population at the previous standard, whereas two-thirds of it stand at disposal for raising that standard. The rigid scarcity of the supply of food, which played such an important part in the Malthusian ideas, is for western civilization a thing of the past. Anxiety for the minimum supply of food, is no longer an outstanding concern of our social economy. Rather, we are embarrassed at present by a great superfluity of the most important foodstuffs. True, in wide circles the consumption of food might still, with great advantage, be raised. If this is prevented by a protectionist policy excluding foreign food and making the people dependent upon the most ineffective elements of home farming, the resultant high price of food cannot truly be said to be an expression of actual scarcity. As a matter of fact, civilized humanity is in the position of being able to devote an ever-increasing part of its productive resources to the satisfaction of less elementary needs than its daily bread, and thus continuously to raise its standard of living.

Under such circumstances it seems difficult to understand what useful purpose could be served by still maintaining the so-called 'law of population' as a fundamental expression for the conditions of social economy and as a starting-point for theoretical discussions thereon. The case is a singularly good illustration of the waste of effort, of both investigators and

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students, still prevailing in economics, and particularly conspicuous in its conservative devotion to stale conceptions and 'laws' which a progressive science ought to have scrapped long ago.

## VII

### THE EQUILIBRIUM THEORY OF PRICES

**E**QUILIBRIUM of social economy requires that demand and supply should balance one another and that this condition be fulfilled at one and the same time for all commodities and services. As generally both demand and supply vary with prices, equilibrium can be attained only at certain prices, which are determined by the condition that there should be a complete balance between supply and demand. As the equilibrium must be disturbed by variation in any single price, *all* prices are involved in the problem and must be determined simultaneously by the conditions of equilibrium. To show how this determination is brought about is the objective of an elementary theory of prices.

The general price-problem cannot be resolved into a series of separate price-problems which could be determined each severally. The demand for a certain commodity is generally dependent not only upon the price of that commodity but also upon the prices of all other commodities. Likewise, the supply of labour in one branch of production is connected with the supply in other branches and with the total supply of labour. The same holds good for other elementary factors of

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production. Generally, the different elements of the social economy are interrelated with one another in such a manner that none of them can be treated separately. For this reason the general price-problem is necessarily one single coherent problem. Such a problem must obviously be treated as a mathematical problem with a number of unknowns which can only be determined by a system of simultaneous equations. A scientific theory of prices must have the form of such a system of equations, and there is no other way of truly representing the actual connexions in the process by which prices are determined. This equilibrium theory of prices is therefore not merely an expression for the particular view of some 'mathematical school'. In fact, it is the only possible theory, and no other theory can be substituted for it or in any way claim a position of equality.

Any one with scientific mathematical training will, of course, immediately recognize that the price-problem has this character. Indeed, in economics it is just as natural and self-evident to use a system of simultaneous equations as it is to use the multiplication table.

However, a definite theory of prices is not established by introducing a system of simultaneous equations. All depends upon what is expressed by that system and what conclusions are drawn from it. In this respect authors who have used systems of equations will probably be found to have differed rather

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considerably. Here I shall confine myself to stating what is the essential content of the equilibrium theory of prices which I have expounded in my *Theory of Social Economy*.

It has often been said, particularly by authors who do not understand very much about the meaning of a mathematical treatment of economic problems, that such a treatment has long been 'common knowledge', and that therefore nothing new could be achieved by presenting an equilibrium theory of prices in the form of a system of simultaneous equations. That this is a completely false view is best proved by the fact that the true meaning of this theory has not yet—a third of a century after the publication of my first paper on the subject—penetrated economic science. As we shall see in this chapter, text-books on the principles of economics even to-day are written without being influenced in any way by the equilibrium theory of prices, and even without any clear idea of the very existence of the problem of equilibrium.

Further, the prerequisite for a mathematical treatment of an economic problem is that the quantities involved shall be arithmetically defined, that is to say, measurable in definite units. If a theory is presented in a mathematical form, but does not fulfil this condition, it has to be rejected as mathematically unsound.

The most common fault in mathematical economics

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is that 'value', 'psychological intensity of demand', or 'utility', are treated as arithmetical quantities, in spite of the impossibility of giving a strict definition of these quasi-quantities or of a unit in which they could be measured. As we have found in Chapter III, this weakness can be overcome only by introducing into economics from the outset the notion of price. Prices are reckoned in a definite unit of money, and thus far fulfil the condition of being measurable quantities. The other quantities entering into the problem of equilibrium are measured in the usual units for length, weight, electrical energy, &c. It only remains to explain, therefore, how the unit of money is fixed. In my representation of the equilibrium theory of prices a monetary system is postulated, and the question of how the monetary unit itself is fixed is left to be treated in a separate theory of money. The central task of this theory is to show how the unit of money may be fixed by a suitable restriction of the supply of means of payment. Thus the general price-problem is divided into two problems: first a problem of how *relative* prices are determined; secondly, a problem of how the *general level* of prices is fixed. This separation of the two different sides of the general price-problem is a *first* characteristic of my treatment of this problem. I believe that it is so natural, and has such great scientific and educational advantages, that it is hardly possible to do without it.

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A *second* characteristic of my treatment of the price-problem is the position it assigns to the 'Principle of Scarcity'. The price-fixing process is best represented as a competition between buyers. A number of buyers bid for a commodity which is supplied in a definite quantity. The process has very much the character of an auction. As the price is raised, buyers reduce their demand. At any particular price every buyer decides how much he wants to buy. The sum of these demands constitutes the total demand. The price must be raised until this total demand has been reduced so much as to correspond to the given supply.

The auction is, however, not so simple as this picture of it would suggest. The auction must embrace all goods at the same time. The reason for this is that the buyers are able to fix their demand for a particular good only when they know the prices of all other goods and see how much they will have to expend for them. The result of the auction is that prices are fixed in such a way that for each good the total demand equals the supply. At these prices the economic system is in equilibrium.

The fundamental reason why prices have to be paid is the *scarcity* of the different goods that people want to have. The function of prices is to force buyers to restrict their demand as much as this scarcity requires. Thus the whole process of price-fixing is based on the principle of scarcity.

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With regard to goods that can be produced, there is no absolute scarcity. The possibility of producing goods, however, only means that their scarcity is referred back to the scarcity of the elementary factors of production. In a fundamental exposition the supply of these factors may be supposed to be given and unalterable. The quantities of the elementary factors of production required for producing different goods may also be supposed to be given (which means that the technique of production is fixed).

Under such circumstances, the competition between buyers may be regarded as a competition for the elementary factors of production. The demand for each of them has its origin in the demand for a number of goods, each requiring a certain quantity of that elementary factor of production. In all these branches of demand one and the same price must be paid for the factor. In this way the demand for the factor is uniformly restricted. The restriction must be so sharp as to bring down the total demand to meet the given supply. Equilibrium is reached when this condition is fulfilled in respect of every elementary factor of production. There must be just as many such conditions as there are elementary factors of production. The mathematical form for representing these conditions of equilibrium is a system of simultaneous equations, each of them telling us that the demand for a certain elementary factor of production is equal



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to the supply. The number of equations must therefore be equal to the number of elementary factors of production. Thus the system of equations suffices to determine the relative prices of these factors and, as a consequence, the demand for them. In this sense the whole price-problem is determined.

The buying power of the public is always divided up between the different factors of production. For this reason, all prices must be determined at the same time. The price-problem is necessarily one, single coherent problem, and it is never possible to get a complete view of the process of price-formation by taking out parts of this process and studying them separately. Even if such an investigation is extended successively to all the different parts of the process, it can never lead to an understanding of the process as a whole.

The price-problem as here outlined is essentially a problem of equilibrium. If no price had to be paid the demand would be almost unlimited, at any rate very much higher than the supply. Consequently demand must be restricted. For this purpose it is not necessary to use prices of unlimited height. Low prices will suffice to eliminate much of the weakest demand. When prices are raised, demand is further reduced but by no means annihilated. When a certain price is reached, demand will be equal to supply and the economic system will be in equilibrium. In

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this situation the demand for every good is precisely balanced by the necessity of paying the equilibrium price for it. The theory of price-formation founded on the principles here set forth may therefore truly be characterized as the 'Equilibrium Theory of Prices'.

This theory is intimately connected with the principle of scarcity. It shows how prices are determined when account has to be taken of scarcity alone, and when the variability in the technical methods of production and other similar complications may be disregarded. This most simple case of price-fixing cannot be explained without having recourse to a system of simultaneous equations. A theory of prices which would evade this mathematical form is therefore unable to deal with the most elementary case of price-fixing and can have no claim to be a general theory of prices penetrating to the very core of the price-fixing process.

The *third* important characteristic of my representation of the price-fixing process is that it embraces *all* prices, and that it places each of them on an equal footing in doing so. This is obviously necessary if we are to be able to construct a true equilibrium theory of prices.

One particular consequence of this principle is that the rate of interest must be treated as a price and that the fixing of this price must be a part of the general price-fixing process. In my theory interest enters as

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a price paid for an elementary factor of production, namely 'capital-disposal' (or 'waiting' in Marshall's terminology). This price must be paid on account of the scarcity of the supply of this elementary factor. Thus the rate of interest is placed in exactly the same position in the price-fixing process as any other price of an elementary factor of production.

Another particular consequence is that the separate treatment of the rent of land, inherited from classical economics, must be abandoned. The use of land is an elementary factor of production, and the price paid for it must have the same place in the price-theory as all other similar prices. The rent of land must be explained fundamentally by the scarcity of land, which makes it necessary to restrict the demand for the use of land by means of a particular price.

An economic theory that does not fully accept these consequences can have no claim to being an adequate explanation of the general price-fixing process and of the conditions of its equilibrium. Still less is it entitled to use a system of simultaneous equations for representing this equilibrium.

A *fourth* characteristic of my presentation of the price-fixing process is that it starts from a study of the most elementary conditions of social economy. The criterion of a good theory is obviously that it is able to explain the price-fixing process under such conditions. It is natural to begin with the simplifying

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assumptions that the *supply* of the elementary factors of production is fixed and that likewise the *technical methods* of production are fixed.

The first assumption leaves out for the moment the question of a possible dependence of supply upon the remuneration that is offered. Such dependence is not necessary, and students should not be brought up to look upon it as an indispensable condition for equilibrium in the system of prices. The first thing that should be cleared up is how prices are determined on the basis of a definite scarcity of supply. This essential side of the price-fixing process is lost if prices are regarded from the beginning as a remuneration that must be offered in order to call forth certain *efforts and sacrifices*. This Marshallian view also leads to a particular concept of *cost* which has neither the generality nor the necessity that such a fundamental concept ought to have. There is a cost even if supply is fixed. The general concept of cost, to which a study of price-fixing under the most elementary conditions leads, is simply the sum of the prices that have to be paid for the different factors of production required. Cost in this sense is a result of the price-fixing process and is determined at the same time as all prices.

The assumption of fixed technical methods means particularly that no substitution of one factor of production for another has to be taken account of. The study of pricing under such simplified conditions is

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necessary in order to get rid of the idea, prevalent in text-books, that the fixing of prices is in some indispensable way dependent upon the possibility of such substitution. Even if no substitution is possible, the price-problem is determined; and price-fixing under such conditions is always at the basis of the more complicated price-fixing in an economy in which we have to reckon with the phenomenon of substitution.

When the price of a factor of production is referred back to its 'marginal productivity', the principle of scarcity is forgotten and one gets the impression that there could be no definite price if there were no opportunity for substitution. Besides, the explanation is unsatisfactory, as the margin referred to can never be determined until all prices are determined. In fact, the margin is an unknown in our system of equations, on exactly the same footing as the prices.

If we build our equilibrium theory on the basis of the principle of scarcity we immediately see that a system of simultaneous equations is the only solution of the general price-problem, and we allow no possibility for evading this solution by bringing into the foreground complications of a subordinate nature. Of course, such complications have to be considered afterwards and their explanation must find their natural place within the framework of our general theory of prices. But under this elaboration of the theory it always remains fundamentally an equilibrium theory of prices.

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The purport of the equilibrium theory of prices is perhaps most clearly understood if that theory is compared with other theories which have been accepted as an explanation of the process of price-formation. Among them we have first to take account of the 'cost-of-production' theory of prices. Logically, such a theory is possible only when the number of elementary factors of production can be reduced to one. This truth has by no means always been understood. To the acute logical mind of Ricardo it was clear, and, as is well known, Ricardo succeeded in constructing a cost-of-production theory of prices by a series of simplifications, including the concept of labour as a homogeneous factor capable of being measured objectively in some time unit; the assumption of a general proportionality between labour and the use of capital as elements in the cost of production; and the elimination of land as a factor of production through the artifice of reasoning only about marginal land.

As early as 1901 I showed<sup>1</sup> that Ricardo's theory was untenable and that it could not be reconstructed but had to be entirely abandoned. The reason is that when we have to take account of more than one elementary factor of production the question is left open as to how the relative prices of these factors of

<sup>1</sup> 'Die Produktionskosten-theorie Ricardos', *Zeitschrift für die gesammte Staatswissenschaft*, 1901.

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production are determined. No cost-of-production theory can give an answer to this question, which indeed can only be answered by an equilibrium theory of prices such as has been outlined above. This ultimate consequence has hardly yet been generally recognized. Moreover, although Ricardo's theory has nowadays been put into the background in the general treatment of social economy, it has maintained a strong hold on theories of international trade—as we shall see presently—and its general simplifications still seem to exercise a magic power over economic thinking. There should be no reason for using such very unnatural simplifications when the purpose they originally had to serve is recognized to be unattainable and when the whole cost-of-production theory of prices has had to be put on the museum shelves of economic science. If once we have to reckon with several factors of production, there is no difficulty in including different qualities of labour as different factors in our analysis; no reason for an assumption of proportionality between labour and capital, which so grossly deviates from reality; and no sense in assigning to land a particular position in the process of price-formation. For an equilibrium theory of prices which reckons with a number of different factors of production it is natural to give each factor the same place in the pricing process. As long as these conclusions are not generally recognized, it will be impossible to say -

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that the equilibrium theory of prices has been generally accepted.

This theory must also be distinguished from another group of theories, which may conveniently be called 'Mutual-Interdependence' theories of prices. Such theories have been regarded as a great step forward, and most modern text-books are probably based on some conception of mutual interdependence. However, the whole idea is vague and has no general application. If we consider a separate price, it is of course possible to draw up a couple of demand and supply curves and to find out at what price these curves cut one another. It is possible to proceed in this way and make a similar investigation for every particular commodity. Such a proceeding may reveal—sometimes even in quite a useful way—a certain kind of interdependence of the factors involved; but it will never lead to a general explanation of the price-formation process as a whole. The only possibility of combining separate detailed studies of price-formation into a logically consistent system is the equilibrium theory of prices. When the terms 'interdependence theories' and 'equilibrium theories' are used without any distinction it must be feared that the real purport of the equilibrium theory has not been clearly grasped, perhaps even that the very existence of the problem of general equilibrium has never been perceived.

We must come to the same conclusion when we



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see to what an extent the idea prevails that 'the whole system of equilibrium economics' must be based on 'the conception of the balancing of increments'.<sup>1</sup> The system of equations, which I use for representing economic equilibrium contains only 'full-size' quantities and no increments of them. Thus the equilibrium theory of prices is shown to be entirely independent of the concept of margins (and therefore also of the principle of substitution). Not until this fact has been realized can there be any true insight into the essence of the theory of equilibrium.

How little the equilibrium theory of prices has penetrated economic thinking, and, indeed, how far from the truth it is that even a general idea of a price-equilibrium could nowadays be regarded as common knowledge, becomes obvious at a glance at some modern American text-books,<sup>2</sup> which seem to be widely read not only in the United States but also in other countries. The prevailing view of this type of text-book is that price (or 'value') is determined by 'marginal productivity', and much care is taken to

<sup>1</sup> *Economic Journal*, June 1935, p. 362.

<sup>2</sup> The works here referred to are: Clark, John Bates: *Essentials of Economic Theory*, New York, 1924. Davenport: *Value and Distribution*, Chicago, 1908. Edie: *Economics*, New York, 1932. Ely (and associates): *Outlines of Economics*, New York, 1923. Fetter: *Economic Principles*, New York, 1915. Taussig: *Principles of Economics*, vol. ii, New York, 1921. Taylor: *Principles of Economics*, 7th ed., Ann Arbor, 1920.

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show in particular cases how prices vary with variations in marginal productivity.

Speaking of wages, rent, and interest as 'three classes of prices', Ely and his assistant editors say: Among 'fundamental facts . . . common to all three classes of prices . . . the most important is diminishing productivity'. Thus the principle of substitution is from the beginning brought into the foreground, and price-determination is made completely dependent upon the existence of an opportunity for substitution. 'If all land really were of a uniform degree', the same authors say (p. 410), 'no rent would be paid until all lands were utilized, when rent would arise on account of the necessity of increased intensity of cultivation.' Here the principle of scarcity is completely eliminated and the reader gets the impression that land could command no price were there no opportunity for a more intensive cultivation. On p. 424 the authors say that the 'proportion of the product . . . attributed to labor is determined by the principle of . . . *marginal productivity*. . . .' In the case of capital, however, the authors find it necessary to introduce a new price-determining ground: 'a reward for waiting has to be paid in the form of interest.' Here the Marshallian idea of cost as a reward necessary to call forth 'efforts and sacrifices' is resorted to.

In literature of this class the most strenuous efforts are made to avoid the principle of scarcity. The motive

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for such attempts is obviously the idea that prices cannot be determined in a situation in which the supply of a factor of production is entirely regulated by a scarcity that cannot be modified in any way, whether by aid of a reward for increased efforts and sacrifices or of a substitution of other factors of production. This idea is, of course, entirely wrong. It can be refuted only by an equilibrium theory of prices showing how prices are determined under the most elementary conditions of absolute scarcity. Text-books dependent for their explanation of prices upon the concept of marginal productivity may well give some valuable analysis of the mutual interdependence of supply and demand in particular cases, but they debar themselves from any possibility of arriving at a general theory of price-formation. The authors seem never to have realized that marginal productivity cannot be regarded as a factor determining price; as already pointed out, it is just as much an unknown in the great problem of equilibrium as prices are. Only when all prices are determined is it possible to decide how far any branch of production should be extended, or how far a particular factor of production should be used; and only then is it possible to speak of any definite marginal productivity. For this reason, a study limited to what happens on the margins will never lead to any explanation of the price-fixing process as a whole.

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To most authors a general problem of equilibrium does not even appear to exist. It is significant that in the text-books quoted the problem is never clearly stated, and that in most cases earlier economists who have used systems of simultaneous equations as a solution of the problem are not even mentioned (Taussig, Clark, Ely; even Cannan).<sup>1</sup> When there is some reference to a system of simultaneous equations its true significance is not clearly understood and the method of handling it is primitive.

Fetter<sup>2</sup> defines rent in the following words: 'rent (in money) of an agent is equal to the *excess* of the price of its products above (money) costs (other than the rental) needed to obtain them and take them to market.' Here rent is described as a residuum. But no residual theory is compatible with the principle of equilibrium. In the Equilibrium Theory, as has been observed above, all prices hold the same position in the price-fixing process, and it is impossible to assign to any of them a separate place as a residuum. As long as mistakes of that sort are repeated we certainly cannot say that the Equilibrium Theory of Prices has been generally understood and accepted.

Although it is mostly abandoned in general economic theory, Ricardo's cost-of-production theory of prices,

<sup>1</sup> *A Review of Economic Theory*, London, 1929.

<sup>2</sup> *Op. cit.*, p. 162.

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as I have said above, has to this day retained its influence on the theory of international trade. Ricardo calculates cost in terms of 'hours of normal labour', and on the basis of such a calculation the whole classical doctrine of 'comparative costs' in international trade has been developed. The great respect still paid to this doctrine definitely proves that economists have not generally recognized the uselessness of the cost-of-production theory of prices and the necessity for replacing it by an equilibrium theory of prices.

In his doctor's dissertation, Stockholm, 1924, Bertil Ohlin (now professor in Stockholm) applied my system of simultaneous equations to the case of international trade and thus put the whole theory of international trade on a new basis. Since then Ohlin has developed this paper into an authoritative treatise: 'Interregional and International Trade.'<sup>1</sup> He definitely rejects Ricardo's theory of prices and in the most convincing way shows the necessity for building the theory of international trade upon an equilibrium theory of prices.

It is rather remarkable, then, that in the treatise quoted (p. 33) Ohlin refers to a paper by Professor Heckscher, 'The Influence of Foreign Trade on the Distribution of Income',<sup>2</sup> as 'a very important analysis'

<sup>1</sup> Cambridge, Mass., 1933.

<sup>2</sup> The paper was published in Swedish in *Ekonomisk Tidskrift*, Stockholm, 1919.

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of the effects of international trade. Ohlin says that he has from the beginning been much influenced by Heckscher's paper, and particularly speaks of 'the point of view first introduced by Heckscher in international trade theory'. In my opinion Heckscher's paper has influenced Ohlin mainly so as to retard him in his endeavours to build up an equilibrium theory of international trade. It would certainly have been better if Heckscher's paper had remained in complete oblivion, but, as Ohlin has now placed it in the first rank of international trade literature, it is necessary to point out here that it suffers from a fundamental mistake which leaves the whole exposition without any foundation. In fact, Heckscher's paper is the most striking proof of the inability of earlier economists to understand the equilibrium theory of prices; and from this point of view it actually deserves some attention.

On p. 14 of his paper Heckscher says that every inequality in the relative prices of the factors of production in two countries must lead to an exchange of products. The result must be, he continues, an '*equalization between the countries of the relative scarcity of the factors of production*'.<sup>1</sup> 'The exchange goes on as long as the relation between the scarcity of the factors of production has not become the same in both countries. When a full equalization is attained

<sup>1</sup> Italics here and in the following quotation as in the original

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the exchange already established naturally remains . . . , but an extension of it is no longer possible—it has reached its goal. Therefore, inequality in comparative costs between the countries no doubt *causes* an exchange, that is to say, is necessary for giving *rise* to an exchange, but is no condition for an exchange already existing; on the contrary, it is doomed to disappear in consequence of a continued exchange. Thus the inequality in comparative costs, that is to say, in the relative prices of the factors of production, annihilates itself.'

After having constructed an arithmetical example, the author concludes: 'Thus the exchange, and therefore with the equalization of the relative prices of the factors of production, continues until this equalization is complete.'

In economics the most erroneous representations often prove to be the most instructive. Fundamental mistakes which dominate current economic thinking, but which usually remain hidden behind the foggiest of this thinking, may be brought into clear daylight when they are stated in their full and naked fallacy. The text quoted is an excellent example, affording definite proof of a complete lack of understanding of what economic equilibrium means.

If absolute obstacles to trade between two countries are suddenly removed the inequality in the relative prices of the factors of production in these countries,

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certainly constitutes a momentary disequilibrium. The inequality is smoothed out by trade—to a *certain extent*. Then a new equilibrium is established between prices and demand. The remaining inequality of prices is a fundamental factor in this equilibrium and cannot cause any further extension of the exchange of goods between the countries.

Trade between two countries and inequality in the relative prices of their factors of production are forces that balance one another. Increasing trade reduces inequality, and this reduced inequality slackens trade. Conversely, decreasing trade is followed by an increased inequality, which stimulates trade. Reactions of this nature are a necessary condition of any stable equilibrium, whether in mechanics or in life. At the point of equilibrium these reactions of the price-inequality just suffice to counterbalance any alteration in the volume of trade. Equilibrium is possible only when both trade and inequality have such strength as to counterbalance one another. Inequality has its greatest stimulating effect on trade at the original stage at which there is no trade and the inequality of the relative prices of the factors of production is at its maximum, being determined entirely by the conditions prevailing in the separate markets. The effect gradually *diminishes* as trade expands. On the other hand, the effect of trade in reducing inequality, being zero at the original stage, *increases* as trade develops.



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Some time a point must be reached at which both effects are equal and therefore will counterbalance one another. This point is the point of equilibrium in the trade between the two nations. At this point a certain inequality in the relative prices of the factors of production still prevails and serves as a basis for trade.

This case is a good illustration of the essential nature of any economic equilibrium. A fruitful discussion of economic problems is possible only when this nature has been fully understood.

The process by which prices are determined in two countries connected with one another in international trade is represented by a system of equations forming a sort of amalgamation of the systems which determined prices in each country as long as they were isolated. However, a new unknown enters into the problem, namely the rate of exchange between the two currencies. On the other hand, we have a new equation expressing the condition of equilibrium in the trade between the countries. Thus the whole price-formation problem is determined for both countries at once. This solution shows that the rate of exchange depends upon all the factors that are of importance for the price-formation in each country, that is to say, generally on the economic conditions in both countries (and naturally also on special conditions of international trade, such as freights and customs duties).

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So far no other theory of foreign exchanges is required.

We must remember, however, that the system of equations for a closed community determines prices only in relation to one another: that is to say, but for a multiplicative factor. We have seen that the fixation of this factor is a monetary concern, in fact is identical with the fixation of the monetary unit. The separation of these two sides of the general price-problem is decisive for the whole construction of economic theory.

In the present case we have two monetary units. The rate of exchange can be fixed only when these two units are fixed. The theory of foreign exchange therefore necessarily resolves itself into two parts: the fixation of the rate of exchange under the assumption of fixed monetary units; and the dependence of the rate of exchange upon variations in the monetary units. The separation of these two sides of the problem is equally necessary and has the same fundamental importance as the corresponding separation, in the case of an isolated country, of the economic theory of relative prices and the monetary theory of the fixation of the price unit.

If the monetary units are allowed to vary, the rate of exchange must vary correspondingly. This variability of the rate of exchange attains the highest degree of practical importance in periods of outstanding instability in monetary units, that is to say, when these

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units are exposed to a marked process of inflation or deflation. If, for instance, an inflation has taken place in both countries, and if the general level of commodity prices has been raised thereby, say to an index number of 500 in one country and of 200 in the other country, the rate of exchange, if calculated as the quotient between the second and the first currency, will be raised in the proportion of 100 : 250. In periods of great monetary revolutions it is of high practical value to be able in this way to calculate those rates of exchange which will approximately correspond to equilibrium when once the two monetary units have been stabilized.

During the War I made such calculations of the new equilibrium rates, and in 1918 I introduced for these rates the name of 'Purchasing-Power Parities'. Since then this concept has proved practically indispensable. In the present discussion of monetary stabilization and of the means of eliminating the unsound competition in undervaluation we are constantly faced with the problem of how to find true equilibrium rates of exchange that may be chosen as a basis for the stabilization of the relative values of different currencies. The calculation of purchasing-power parities on the principle here indicated will in all such cases represent a first approximation towards a well-balanced solution of the problem.

An exact solution cannot be obtained in this way.

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Indeed, we have seen in Chapter III that under dynamic conditions no true equilibrium rate of exchange can exist. We simply have to fix a reasonable rate and then force economic conditions to adjust themselves to that rate. In most cases the inevitable frictions will probably be reduced to a minimum if the stabilized rate of exchange is based upon a reasonable calculation of the purchasing-power parity.

We must not, however, forget that the *economic* factors which determined the rate of exchange under stable *monetary* conditions may have altered during a period of instability. If this has been the case, the new equilibrium rate of exchange will be affected by this alteration. The necessary correction will, however, generally be small in comparison with the tremendous alterations often resulting from alterations in the monetary units.

It should also be observed that a process of inflation (or deflation), although of a purely monetary nature, cannot but affect economic conditions and relative prices (Chapter III). Generally, however, such effects will be of secondary importance. Their existence should in no way prevent us from using the purchasing-power parities as calculated on the above principles as a first approximation towards finding new equilibrium rates of exchange.

Actual exchanges will always be found to deviate from the purchasing-power parities. There are several

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causes of such deviations, both on the monetary and on the economic side. In my book *Money and Foreign Exchanges after 1914* (London, 1922), in which I outlined the theory of purchasing-power parities, I announced the existence of such deviations and also stated their principal causes. Numerous objections have since been raised against the theory of purchasing-power parities. My critics have manifestly never realized the need, pointed out above, for a treatment of the monetary side of the theory of foreign exchange as a separate problem. Thus, having failed to understand the true meaning of the theory of purchasing-power parities, they have indulged in finding fault with the theory on the ground that rates of exchange calculated in conformity with it did not always exactly correspond to the actual rates. As we have seen in our discussion of the method of gradual approximation (Chapter V), this objection does not impair the value of the theory. The purchasing-power parity retains its fundamental position as the first approximation. Only when this parity is known are we in a position to detect deviations from it and to measure them. Until the purchasing-power parity has been established, deviations from that parity cannot even logically exist. When, however, the purchasing-power parity has been calculated, the field is open for new investigations with the object of finding the causes of the deviations. Thus the entire analysis of

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the movements of the rates of exchange gains far greater strength and fertility than would have been possible without the fundamental theory of purchasing-power parities. The practical value of such an analysis should by this time have been firmly established after many years of experience. The whole case is an excellent illustration of what has been said in Chapter V regarding the method of gradual approximation.

After all this discussion on the general price-problem, the reader may well ask: What is the use of the solution of the problem that has been offered here? Is it more than a mere logical exercise? Can it be of any appreciable value for educational or practical purposes?

The first answer to make to such questions is that economic analysis simply has to be scientific in the sense that it should be logical and lead to a consistent explanation of the whole of the matter it has chosen to study. When universities undertake to teach economics they should not leave the student under the impression that he has penetrated to a comprehensive and consistent explanation of the economic process if in reality he has only got some disconnected glimpses of that process. The principal aim of education must always be to impart to the student a sincere desire for thoroughness and an instinctive dissatis-

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factions with solutions that have the air of saying more than they actually do.

The habit of taking a wide and comprehensive view of any subject in which we are interested is of high value, not only in science but also in practical life. People in leading positions in public life will constantly have to make decisions having far-reaching consequences; it is important that such people should have acquired this habit during the course of their education. This is particularly so in economic affairs. There is danger when the average politician or central bank leader is accustomed to consider only those consequences of his acts which happen to attract his immediate interest. When, later on, unpleasant consequences appear the usual defence is that 'these were something nobody could foresee', or that 'other factors' have caused the undesirable effect. Yet a scientific training in the analysis of social economy as a whole would in many cases, including the most important ones, have made it quite possible to foresee the consequences, at least in their general character, and afterwards to establish the true causal connexion.

In every country post-War experience of economic policy will doubtless supply plenty of instructive examples to this general statement. Let us only look at the frequent experiments in government regulation of price-formation. Even the most elementary analysis of the secondary effects of an arbitrary alteration of

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prices on demand and supply would in most cases have sufficed to discourage experiments of that sort. There are, of course, cases of such a complicated nature that even the most elaborate mathematical analysis would be unable to calculate the effects of a given measure of State intervention. But should not this very uncertainty with regard to consequences deter any sensible man from taking action? In fact, the strongest case for *laissez-faire* should be the extreme difficulty of perceiving in advance the consequences of any form of State interference. This argument gains immensely in strength when we see—as we now do, year after year—how impossible it is, even afterwards, when complete statistics are available, to give a reliable account of the effects of different State measures that have been adopted.

Most State intervention after the War has had the character of an endeavour to fix particular prices at a height other than that corresponding to a natural equilibrium of the price-system as a whole. Politicians have looked upon prices as something that could be directed simply by political power. They have certainly had no idea of an equilibrium theory of prices; and they have never understood that an arbitrary alteration of one price must have far-reaching consequences, influencing not only other prices but also demand, direction of production, and use of the elementary factors of production. When the actual



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effects of political interference in the price-formation process have appeared, they have often been so harmful that it has been thought necessary to prevent them by new legislation. The result has naturally been fresh, and often aggravated, disturbances of the price-system and of the social economy as a whole. Thus the field for State interference has been continually widened, with the result that the very delicate mechanism of the world economy has been seriously damaged and largely put out of function. We all know the result, which manifests itself in the appalling degree of unemployment and in the outrageous contradiction between misery and starvation on the one hand and overwhelming abundance on the other. Is it too much to say that such disastrous mistakes could have been avoided had economic students been brought up to a clear and comprehensive view of the process of price-formation as an economic necessity, and had politicians and central bankers been more inclined to seek that sort of economic advice the essential value of which lies in the faculty of surveying social economy as a whole?